# ELECTRICAL REVIEW

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## Necessary Kilowatts

### Fundamental to National Industries

COMMENTING on the two new generating plant programmes of the Central Electricity Board announced in our issue of September 19th, we then expressed the view that the increase in kilowatt capacity proposed would be no more than adequate to meet the demand in the winter of 1952. As these programmes were drawn up before the Government decision to curtail capital expenditure on schemes that did not aid export, it has been suggested, notably by Sir Norman Kipping of the Federation of British Industries (as mentioned by us last week), that the full capacity projected might not now be necessary.

#### Not a Net Increase

Our own view, based on deductions drawn from published information, is unchanged. To begin with, the 10 million kW of new plant (including that provided for under earlier arrangements) to be in commission in 1952 is not a net figure. From it must first be deducted some 600,000 kW for works auxiliaries and then upwards of 2 million kW to fill the present gap between maximum demand and output, in order to give the net capacity available. Staggering the industrial load during the coming winter is expected only to alleviate the position.

The proportion of plant out of service at peak loading has risen at times during recent years to over 20 per cent of the total installed. The leading causes are breakdown and overhaul of units and the burning of coals that are unsuitable to particular combustion arrangements or that possess a high ash content. While the first two causes are likely to be of less moment as maintenance staffs become more adequate and as the amount of older plant in use becomes less, the longer hours of running under staggered loads will be an offsetting feature. Also the figure of 10 million kW is a bulk one for the whole country, whereas the ability of the grid to transmit electricity from one area to another is limited, which entails leaving a further margin. Weighing up the various items, it would appear that the allowance for operating contingencies should not be less than one-eighth of the rated capacity, which, however, leaves no reserve for unforeseen mischances.

#### Ageing Plant

Apart from such shortcomings, maximum rating is usually 25 per cent of the most economical loading, and so to run "all out" is to waste fuel. A further and most important consideration is that five years hence about 2½ million kW of generating plant now running will be quite unfit for service. Taking account of all the factors mentioned, the net capacity of the new plant appears to be barely enough to meet the modest estimate of about one-third increase in maximum demand without load-shedding in 1952, even if construction can be carried out on time. Reasons for legitimate doubt on this point are illustrated by the experience of last year, when owing to labour and material shortages and other delays less than one-quarter of the million kW arranged for was actually brought into service.

The amount of electricity sold for power has hitherto been regarded as an index of industrial productivity, and it would be strange indeed if the stepping-up of exports were not accompanied by a corresponding increase in the kW required. Even if there were over-production of generating plant, there should be little difficulty in diverting the surplus to overseas markets. Electricity supply is not just one of many services making claims on national resources, but a vital factor enabling the others to function. It would be disastrous if the Government, having learned this lesson in the hard school of recent experience, should be turned aside from its resolve that the necessary generating plant shall be made available.

**Convention Next Year**

WHATEVER the future of the I.M.E.A. may be (and, as we have said before, we hope that it will have a future in some form) the annual Convention is to be continued for at least another year. Lord Citrine, chairman of the British Electricity Authority, fully realizes the value of such events and has pledged the Authority's support. Arrangements have already been put in hand by the I.M.E.A. and we trust that the 1948 Convention will be regarded as the beginning of a new series rather than the end of the old.

**Electron Jubilee**

HALF a century ago J. J. Thomson announced his discovery of the "negatively charged corpuscle," a discovery which has been described as of greater import to science, both pure and applied, than any other. Last week's jubilee celebrations serve as a reminder that almost all the more recent major steps towards the understanding of the atomic structure of matter (so closely associated with the Cavendish Laboratory and the name of Rutherford, who was selected by "J. J." himself as his own successor) have been based largely on Thomson's discovery. The significance of the greater mobility of the negatively charged electron by comparison with that of the positively charged particle (the positron), was stressed by Thomson forty years ago in his I.E.E. lecture on the "Theory of Electrical Conductivity in Metals," in which he outlined the modern electronic concept of matter. Yet the I.E.E. does not possess any suitable memorial to his work. It is fitting, therefore, that the Council should have commissioned Mr. Francis Hodge (to whom the posthumous portrait of Oliver Heaviside is due) to paint a portrait for the Institution's headquarters in London.

**Unions Celebrate**

ON page 503 of this issue we report a dinner held by the trade union side of the N.J.I.C. for the Electricity Supply Industry to mark the nationalization of electricity supply. Commingled with satisfaction at the achievement of their aims those present exhibited a sense of increased responsibility. This is as it should be; the success or failure of nationalization depends as much upon the workers of the industry involved as upon the controlling authorities—as events in the coalfields are showing. In this respect electricity supply has a good record. There seemed to be a little doubt whether the workers would get more out of a national authority than they had obtained from the previous owners. It would give the British Electricity Authority a bad start if it were confronted at the outset with a general demand for higher wages.

**Fuel Co-ordination**

AT the same function Mr. Shinwell said that to complete the "trilogy" of fuel nationalization the gas industry had still to be taken over. This would enable coal, electricity and gas to be so co-ordinated as to establish a great by-product industry. Such a co-ordination is a worth-while goal, if it can be attained without interfering with the natural development of electricity.

**Under False Colours**

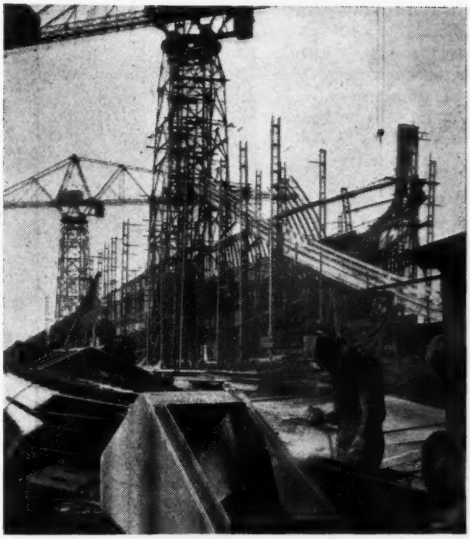
THE Institution of Electrical Engineers recently found it necessary to apply for an injunction against a man to restrain him from using the designation "A.M.I.E.E." to which he was not entitled. The Secretary says that the practice has increased lately and the Council is taking energetic steps to put it down. Employers can help by checking the claims to membership of prospective employees and all members should be concerned to protect the Institution, and themselves, by reporting any false claims to membership.

# Scottish Shipbuilding

## Diverse Uses of Electricity in the Scotstoun Yard

ONE of the most modernly equipped, although not large, the Scotstoun shipbuilding yard covers some twenty acres of the north bank of the River Clyde. It has remained since 1860 in the ownership of Charles Connell & Co., Ltd., and during that period 456 ships of the merchant class have been built, in addition to special craft for war service. There are four berths in which vessels of up to 10,000 tons gross are normally built, the largest so far constructed there having a displacement of 21,200 tons, a length of 518 ft and a beam of 63 ft 7 in.

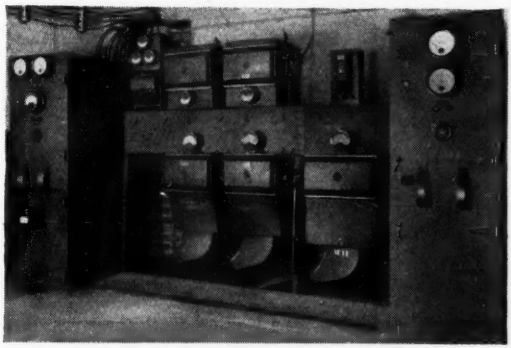
Electricity was introduced in 1910, but it was not until 1936 that steam power was displaced entirely; this progressive action at the time when shipbuilding was at its lowest ebb has since proved its value in terms of power economy, reduced maintenance, and general convenience, which mean higher efficiency. With a present average output capacity of five ships a year, all power and most other services are now performed electrically, excepting riveting and caulking, certain hydraulic appliances and some of the cranes.



**Welding sections at the open end of the fabricating shop at Scotstoun shipyard**

Practically all the electrical equipment has been supplied by the English Electric Co., Ltd., and extensions which are now in preparation will involve the provision of more electrical plant.

Energy is taken from the Glasgow Corporation's 6·6 kV mains through an 800-kVA transformer, already fully loaded when working normally, stepping down to 440 V, three-phase, four-wire. The main circuit breaker, of the "OB.3" air-break type, is in a steel cubicle coupled to a "combination" switchboard fitted with h.r.c. cartridge fuses, whence three-core cables go underground to a number of distribution points while a four-wire circuit goes to a smaller similar board controlling the lighting circuits. Both boards are in a brick-built substation near the entrance gates and power factor correction is effected by a number of separate static condensers connected at various points in the yard.



**Power switchboard in main substation**

For arc-welding the decks, superstructures and interiors of ships under construction, four transformer houses of steel plate

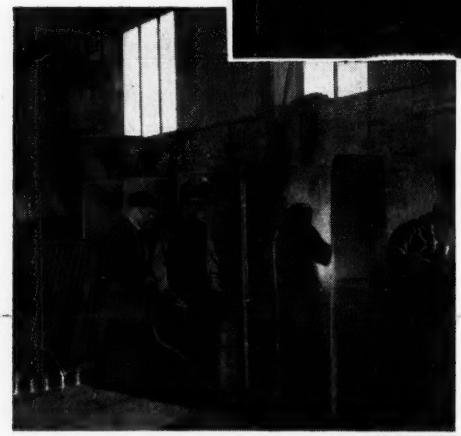
have been built into the bases of the four fixed electric tower cranes which serve the berths, two being at the bow end and two at the stern end. Each contains two six-operator 440/100-V transformers (controlled on the primary side by a combination fuse-switchboard) whence 100-V cables go to the individual welding regulators on the ship.

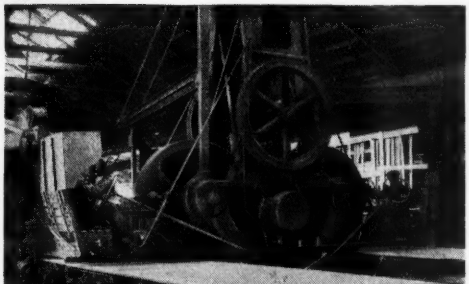
While a reasonable length of lead must be allowed between the regulator and the operator's electrode holder so that his mobility will not be restricted, it is important that the total voltage drop from the transformer to the electrodes (hence the voltage variation) shall be minimized. To this end seven-core cables, comprising six conductors and one common neutral, are used between the transformer and the ship. Practical tests have shown that the lower reactance of the multi-core cable results in a smaller voltage drop than that in a number of equivalent single-core cable arrangements, with the additional advantages of providing an earth return which is less likely to be interrupted, of being more compact and handy, a lower first cost and probably a longer life.

Each of the seven-core cables terminates in a portable plug-box on the ship, enabling the regulators to be plugged-in to the box most conveniently placed. In addition to the four main transformer houses, two outdoor cubicles are provided for temporary lighting, each containing a 440/110-V transformer controlled by a combination fuse-switch.

**General view of the fabricating shop**

In addition to the arc-welding of the ships in their berths, such parts as bulkheads, deck houses and other sections of superstructures are prefabricated in a workshop. Automatic welding is extensively used in this prefabricating shop, which is 180 ft long by 90 ft wide and 40 ft high to the crane rails. By means of





**Above: Learners using a.c. arc-welding equipment. Right: Double-sided one-man punch**

the 15-ton overhead electrically driven travelling crane, complete prefabricated sections can be transported to the open end of the shop where they are transferred to the outside 35-ton electric travelling tower crane, which has a radius of 60 ft and serves two of the berths. This crane, operating in conjunction with the four fixed tower cranes, enables the prefabricated sections to be taken to ships in any of the four berths. The travelling tower crane is supplied with power through a trailing cable which coils round a counter-balanced drum on the base of the crane and lies neatly in a concrete slot in the runway when paid out from the drum, so that it is protected from the risk of damage. Isolating switches are provided in a pit under the runway at the point where the trailing cable is anchored.

Frame saws for cutting logs

In the fabricating shop is a set of learners' benches at which young men are taught the craft of arc-welding. For this shop there is a small electric substation, fed from the main substation, for distributing the power for all welding. It contains a combination fuse-switchboard and a 45-kVA, 440/110-V transformer for lighting in ships under construction.

View of the joiners' shop

In the shed where ships' plates are punched for the rivets, bent, shaped and bevelled, a number of electrically driven machines are installed. One of them is a double-sided one-man punch. Two plates on which the rivet holes have been marked-off are laid on two sets of rollers, one on each side of the machine. Each plate is moved lengthwise, or laterally as required, and the holes punched under the control of one operator. Power distribution to the various motors in the plating shed is through multi-way h.r.c. cartridge fuse equipments in weather-proof steel cabinets mounted on the stanchions of the shed.

As pneumatic drills proved somewhat wasteful because of loss of air pressure in the long pipe lines, which were also rather cumbersome, drilling and reaming on the ships is now done by electric drills driven by 200-c/s three-phase motors. The high-frequency supply is provided by motor-generator sets of about 110 V and is distributed to boxes alongside the berths into which the drill leads can be plugged. The plugs and sockets are of different dimensions from those used for the welding supply, so that inadvertent misuse is prevented.

The woodwork for the ships, including the interior furnishings, is made in a joiners' shop equipped with a large number of modern, electrically driven woodworking machines. In the adjacent saw mills are two frame saws

for cutting logs, driven through gearing by electric motors at the top.

Each motor and other electrical item has been individually selected for its particular purpose, with special reference to the rather onerous duties and in some cases unfavourable conditions inseparable from shipyard work. The flexibility of electrical drives generally in shipyards in respect of re-arrangement and extension of machine shops to satisfy new requirements was demonstrated during the war.

# Future Development

### E.D.A. Area Conference at Southport

VARIOUS aspects of electrical development were discussed at the autumn conference of E.D.A. (North-West England and North Wales Area) held in the demonstration theatre of the electricity showroom, Southport, from September 22nd to 24th. LT. CDR. E. J. COOK, R.N. (Retd.), of the Trent Valley and High Peak Electricity Co., Ltd., who is chairman of the Area Committee, presided. The conference was attended by about 130 delegates, representing fifty-two undertakings, to whom the Mayor of Southport (Coun. J. Peet, J.P.), gave a civic welcome.

MR. V. W. DALE, general manager and secretary of the Association, in opening the conference, said he felt that the industry had, perhaps, turned the corner, and that last winter we reached the depths of our electrical depression. By 1951 we could fairly hope that there would be a reasonably abundant supply of electricity available.

MR. O. HOWARTH, M.I.E.E. (Lancashire Electric Power Co.), submitted a paper on "The Organization of a Consumer Service" and described the service of the L.E.P. Co. which has 70,000 consumers, the vast majority of whom are domestic.

Electricity services in sparsely populated rural areas, were discussed by MR. S. G. ROPER, of the North Wales Power Co., Ltd. He said that many electricity supply undertakings, especially the larger ones, already had their own methods of training staff to deal with service within their own areas, but had not the time arrived when some larger scale methods of training should be made more available to deal with the time when rural development would be in top gear again? The technical adviser required must, in the future, have specialized training, especially in view of the fact that the complete electrification of the undeveloped rural areas would almost certainly have to be carried out on an uneconomical basis.

There were two papers on street lighting, one by MR. C. C. SMITH, A.M.I.E.E. (City Lighting Engineer's Department, Liverpool), who dealt with "Practical Aspects of Street Lighting in Large and Small Towns," and the other by MR. E. W. ROBINSON, B.Sc., A.M.I.E.E. (Lighting Service Bureau) on "Recent Developments in Street Lighting."

The question of future trends, said Mr. Smith, could not be mentioned without special reference to the possibilities of the application of the fluorescent tube to street lighting. Several experimental installations were now in commission, including one in Liverpool, and it was hoped that much useful data would be forthcoming after a reasonable period of service had been completed. The possibilities of the use of plastics must also be mentioned. There was also the growing tendency to use light alloys for brackets and lantern bodies. In this connection he mentioned a lantern of general symmetric distribution qualities for use in residential thoroughfares now being developed, which consisted of a cast silicon aluminium body with vitreous enamelled reflector and methyl methacrylate bowl, the total weight being under 5 lb.

"The Future of Electricity Supply—The Consumers' Viewpoint," was the subject of short addresses by ALDERMAN KATE CLARKE (Chester), COUN. MRS. A. M. HOGG, J.P. (Kearsley), and MRS. J. A. WOOD (Preston).

# Load Shedding Arrangements

IN a memorandum to electricity supply authorities the Electricity Commissioners refer to the steps which are under consideration to mitigate the effects of load shedding which may be necessary during the winter. They say it has been suggested that any such load shedding could be carried out on a more selective basis and with a minimum of dislocation to important industries where the main distributing centres and substations are manned and are in touch by telephone with the main control centre of the undertaking. A number of undertakings already have effective arrangements of this kind in operation. In other cases undertakers are asked to consider as a matter of urgency whether their present arrangements can be improved by, *inter alia*, the installation of telephones at additional substations and distributing centres.

The Ministry of Fuel and Power has been informed by the General Post Office that within reasonable limits applications for the installation of additional telephones for these purposes will be given precedence, although no new exchange facilities can be installed at central control points before the winter.

In cases of delay or difficulty the Commissioners offer to consider whether they can be taken up with the Post Office.

# Nationalization of Supply

## Trade Unions' Celebration

TO mark the passing of the Electricity Act, 1947, and the inauguration of the British Electricity Authority, the trade union side of the National Joint Industrial Council for the Electricity Supply Industry held a dinner at the Dorchester Hotel, Park Lane, W.1, on September 23rd. Mr. Tom Cochrane, secretary of the trade union side, was responsible for the arrangements and the guests included Mr. E. Shinwell (Minister of Fuel and Power), his Parliamentary Secretary (Mr. Hugh Gaitskell), the chairman of the British Electricity Authority (Lord Citrine) and several members and representatives of the Central Electricity Board, the Electricity Commission and other organizations.

MR. FRANK FOULKES (general president, Electrical Trades Union), occupied the chair and proposed the toast "The Electricity Act, 1947." He said that in no other country in the world would the "dispossessed" fraternize with the new possessors as they were doing at that function. He felt that in the majority of cases the experience and knowledge of the dispossessed would be placed at the disposal of the new Authority. Mr. Foulkes said that harmonious labour conditions existed in the industry, making the Minister's task easier than the taking over of the coal mines.

### Industry's High Standard

In the course of his reply MR. SHINWELL said that the Act would never have come about without the assistance of the organized workers in the industry. The comparatively smooth passage of the Bill was a tribute to the country's Parliamentary system and spirit of compromise. The electricity supply industry had a high standard of ability and intelligence but it suffered from a shortage of equipment and the public would have to be patient until this could be remedied. The National Coal Board had been accused of bureaucracy and over-centralization. He refuted these charges and claimed that there had been decentralization as there would be in the electricity supply industry. But decentralization emerged as much from the bottom as the top; all must play their part in administration and none could escape responsibility.

Mr. Shinwell said that it still remained to nationalize the gas industry. This would round off the scheme for taking over the fuel industries and to co-ordinate them so as to found a great by-products industry.

MR. T. ECCLES, vice-chairman of the trade union side of the N.J.I.C., proposed the health of the British Electricity Authority and said that the unions had planned and worked for nationalization for many years. They welcomed the Authority but that did not mean that they gave it a blank cheque. The industry had an important part to play in the reconstruction of the country and the unions appreciated their responsibility.

### Smooth Transition

LORD CITRINE responded and referred to his early connections with the District and National Councils. He said that the Authority aimed at a smooth transition and its first business was to make adequate preparation for taking over the large number of existing authorities. They had to establish harmony among themselves and convince others of the sincerity of their intentions. He did not anticipate pressure from the Minister but realized that the industry had to fit in with the general economic policy of the country. Although the Area Boards would be autonomous they would be glad of the guidance of the Central Authority and, reciprocally, that Authority would welcome the Boards' assistance. They did not want rigid standardization.

They hoped to preserve the state of goodwill existing in the industry and he paid a tribute to the electrical press for the objective way in which it had treated nationalization. He also expressed appreciation of the work of the Central Electricity Board and the Electricity Commissioners upon which the Authority would build up its system. Plant shortage was a matter largely out of their hands, one in which the Authority would be dependent upon the electrical manufacturers and the civil engineering industry. He anticipated that higher plant costs might mean increased charges and this would probably and unfairly be attributed to nationalization. If they were asked to curtail their £450 million programme there would be a further serious lag; already conditions were delaying delivery through no fault of the manufacturers.

### Continuation of Wages Machinery

Lord Citrine said that the Authority wished to continue the present machinery for settling wages and conditions and it recognized the necessity for education and training. He considered that efficiency was ensured by the ingenuity of British electrical engineers and by their research and invention. By deeds and not words they wanted to demonstrate that the Central Authority and Area Boards were out to give a fair deal.

MR. W. J. TUDOR proposed the health of the guests and MR. E. W. BUSSEY (a member of the Authority) responded and said that the trade unions realized that they had responsibilities as well as rights. It should be recognized that workers had at times sacrificed a great deal to ensure that the supply was maintained.

# Views on the News

## Reflections on Current Topics

I HAVE always maintained that it should be impressed upon the electricity consumer that the less he uses the smaller will be his bill. This in itself should be an incentive to economy, but the Stretford and District Electricity Board is making it even more worth while. It is arranging that any consumer who achieves a 10 per cent economy during the two winter quarters, as compared with the corresponding periods of 1946-47, will be given an additional discount equal to the saving; for instance a saving of 25 per cent will entitle him to a discount of 5s. in the pound. It is left to the consumer to check his consumption and make his claim.

* * *

A brave endeavour to break a tradition to secure a reduction in the domestic peak is being made by three electricity supply companies in West Wales. These companies find that there are about 2,000 electric wash-boilers on their systems in Carmarthenshire, Cardiganshire and Pembrokeshire, each calling for the equivalent of 3 h.p. of plant, and practically all of them are used on Monday morning. Therefore the companies have prepared a scheme under which consumers in each of five districts are asked to use their wash-boilers on a particular day of the week, from Monday to Friday. This is an experiment which should interest other undertakings and I await the results.

* * *

Last week Mr. Shinwell made reference to the nationalization of the fuel industries and said that the taking-over of the gas industry would complete the "trilogy." This prompted a correspondent to *The Times* to look up "trilogy" in the Concise Oxford Dictionary where he found it defined as a "set of three tragedies to be performed in immediate succession."

* * *

The case of excessive zeal in lighting economy which I referred to last week is capped by an incident recorded in a Bedfordshire paper. The assistant manager of a store wished to have a photograph taken of a window display. It was found that the reflections precluded a satisfactory job in daytime so the photographer arranged to take the picture in the evening and when everything was ready the lights were switched on. Two minutes would have been enough, but immediately along came a policeman, took the name and address of the assistant manager and told him the matter would be reported. The man spent all the next morning trying to get permission to switch the lights on for two minutes, made four telephone calls to the police, paid two visits to the local fuel overseer, and rang up the regional fuel controller's office three times before he succeeded.

* * *

It is a sign of the times when the chairman of a Housing Committee apologizes to tenants of Council houses who have gas but want electricity. Apparently the Ministry of Health disfavours the installation of electricity in Richmond Council dwellings and the chairman has told the disappointed tenants: "I would like to assure those who are gas served that the Committee are anxious to carry out the work as soon as possible, and that the deferment is not our fault."

* * *

A point that provoked a good deal of discussion at the Association of Public Lighting Engineers' recent conference at Southport during the discussion of Mr. R. W. Steel's paper on "Side Street Lighting" was the problem of trees. When trees are fully grown the lighting engineer knows the worst and can accordingly make the best of a bad job. With newly planted trees, however, it may be ten to fifteen years before any real interference with the lighting is noticeable and then frequently nothing much can be done about it. Here surely is a case for co-operation between the lighting and highways authorities in the matter both of choice of the most suitable varieties of trees and of siting.

* * *

A report from Philadelphia says:—"Two American research scientists, Dr. Pauline Mack and Dr. Harold Schilling, exposed a soiled cloth to ultra-sonic sound waves of 18,000 frequency and had it clean in a few minutes. They believe that sound may some day replace soap." This is a message of hope for housewives and small boys.

—REFLECTOR.

# Over-Current Relays

## Current-Voltage Relation for those of a Directional Type

**By A. Salzmann,** A.M.I.E.E.

DIRECTIONAL relays of the induction type comprise two elements, a directional or wattmeter element and an over-current element. On the assumption that like polarity is required for contact opening, the directional element is correctly connected if like instantaneous polarity is impressed on the terminals of current and potential coils with power flow towards the busbar. The contacts of the directional-element disc remain open, preventing the operation of the over-current element. With power flow away from the busbar, the polarity of current and voltage coils of the directional element is opposed, and the closed contacts complete the circuit of the current element, which will operate the oil circuit-breaker at excess current (Fig. 1).

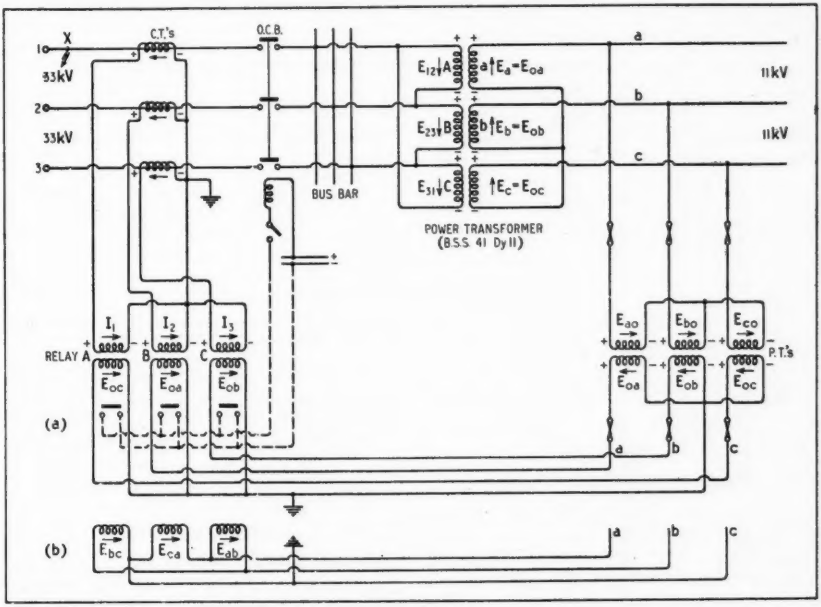



**Fig. 1.—Diagram of connections for triple-pole directional over-current relay. Arrows indicate normal direction of power flow, which is in the opposite sense to that necessary to operate relay**

If both current and voltage coils are connected through instrument transformers on the high-voltage side, the connection presents no difficulty. We must associate currents and voltages which are generally displaced by 30 deg, giving the current an initial lead of 30 deg, i.e. 30 deg connection at unity power factor. It is very important that the voltages applied to the single-pole relay units should lag and not lead the relay currents in order to secure correct relay operation under severe fault conditions.

The potential coils of the directional elements can, however, be energized from the low-voltage side. The expensive potential transformer (outdoor type with ratio of 33,000/110 V) is replaced by the less expensive 11,000/110 V indoor type. The current coils are connected through current transformers on the high-voltage side, but the voltage coils through potential transformers on the low-voltage side.

When combining currents and voltages in the single-pole relays A, B and C, the phase

displacement of voltages between primary and secondary of the power transformer must be taken into consideration. By aid of vector diagrams shown in Fig. 3 the correct current-voltage relationship can be found. The vectors $E_{01}$, $E_{02}$, $E_{03}$ represent the phase voltage of a star-connected generator. Since two windings are connected in opposition the line to line voltages between two terminals is the geometric sum of $E_{13} = E_{03} + (-E_{01}) = E_{03} - E_{01}$, $E_{21} = E_{01} + (-E_{02}) = E_{01} - E_{02}$, and $E_{32} = E_{02} + (-E_{03}) = E_{02} - E_{03}$, taking the vector $E_{01}$ as reference vector.

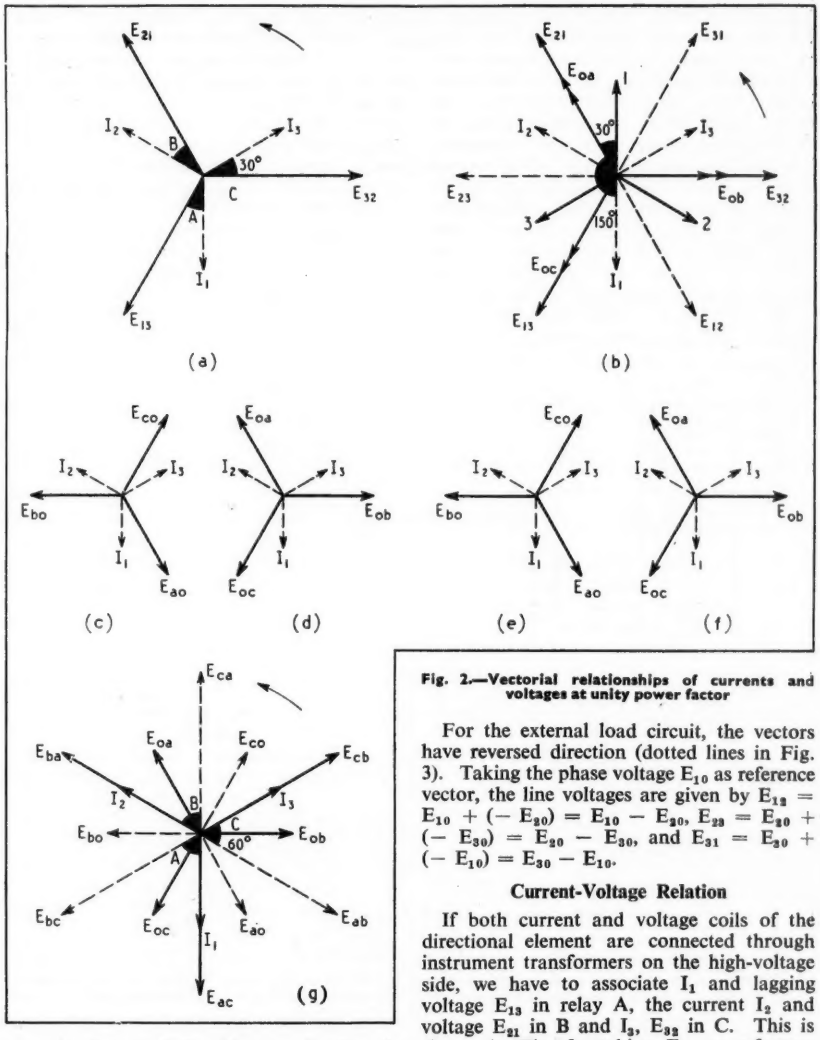



**Fig. 2.—Vectorial relationships of currents and voltages at unity power factor**

For the external load circuit, the vectors have reversed direction (dotted lines in Fig. 3). Taking the phase voltage $E_{10}$ as reference vector, the line voltages are given by $E_{12} = E_{10} + (-E_{20}) = E_{10} - E_{20}$, $E_{23} = E_{20} + (-E_{30}) = E_{20} - E_{30}$, and $E_{31} = E_{30} + (-E_{10}) = E_{30} - E_{10}$.

### Current-Voltage Relation

If both current and voltage coils of the directional element are connected through instrument transformers on the high-voltage side, we have to associate $I_1$ and lagging voltage $E_{13}$ in relay A, the current $I_2$ and voltage $E_{21}$ in B and $I_3$, $E_{32}$ in C. This is shown in Fig. 2a taking $E_{10}$ as reference vector. The direction of the instantaneous quantities in the relay circuit is the same as in the primaries of the instrument transformers, assuming power flow towards the

busbar and the C.T.'s and P.T.'s to have subtractive polarity, their windings being wound in the same sense. The direction of current and voltage in the primaries is from terminal (+) to terminal (−) (load effect), in the secondaries from (−) to (+) (generator effect) and in the relay circuit from (+) to (−) (load effect).

By connecting the potential coils through P.T.'s to the low-voltage side but the current coils through C.T.'s to the high-voltage side, the interposed delta-star power transformer will alter the phase relation between current and voltage in the relay, since a phase displacement of 30 deg exists between the primary induced phase voltage and secondary developed phase voltage; alternatively the phase displacement is 150 deg between primary applied phase voltage and secondary developed phase voltage (see B.S. 171: 1936, 41 Dy 11).

The vector diagram is shown in Fig. 2b at unity p.f., with $E_{01}$ as reference vector. The full lines represent the induced voltages, the dotted lines the applied voltages to the primary. The vectors marked by double arrows are the secondary developed phase voltages (generator effect). To the primary of the P.T.'s we apply the voltages $E_{ao}$, $E_{bo}$, $E_{co}$, which have the direction from the terminal (+) to (−) (load effect) (Fig. 2c). The developed phase voltages $E_{oa}$, $E_{ob}$, $E_{oc}$, in the secondary acting from (−) to (+) are in phase with the developed phase voltages on the secondary of the power transformer (Fig. 2d). The direction of the impressed voltages $E_{ao}$, $E_{bo}$, $E_{co}$, across the terminals of the potential coils of the single-pole relays A, B and C (external circuit) is from (+) to (−) (Fig. 2e).

To ensure correct relay operation we have to associate the currents $I_1$, $I_2$, $I_3$ with voltages on the low-voltage side which are in phase with the line voltages $E_{13}$, $E_{21}$, $E_{32}$ on the primary side (compare Fig. 2b with 2f). Hence $I_1$ $E_{oc}$, $I_2$ $E_{oa}$, $I_3$ $E_{ob}$ are to be combined in the relays A, B and C. This is possible by reversing the voltages applied to the terminals of the potential coils of the relays in order to bring $E_{oc}$ in phase with $E_{13}$, $E_{oa}$ in phase with $E_{21}$ and $E_{ob}$ in phase with $E_{32}$. The final vector diagram is shown in Fig. 2f.

Alternatively, since fault-current distribution of 2: 1: 1 at two-phase fault on the star side of the power transformer produces voltage triangle distortion and the power factor of the fault current due to the interposed power transformer in the line will be very low, the 30-deg connection gives unsatisfactory protection. By modifying the voltage-coil connections employing the 60- or 90-deg connections, correct current-relay operation is ensured under severe fault conditions. The current-voltage relationship is shown in Fig. 2g taking $E_{oa}$ as reference vector. The full lines represent phase and line-to-line voltages on the secondary of the P.T.'s (generator effect) and the dotted lines represent voltages applied to the relays (load effect).

To give the relay currents an initial lead of 60 deg at unity p.f. the current $I_1$ and voltage $E_{bo}$ are combined in relay A, $I_2$ $E_{ca}$ in relay B and $I_3$ $E_{ab}$ in relay C. The diagram of connections is shown in Fig. 1b (B.S. 171: 1936. Power transformer main group 4, 41 Dy 11, or 42 Yd 11, or 43 Yz 11).

For power transformers main group 3 (31 Yz 1, 32 Yd 1 and 33 Yz 1), the phase displacement between induced primary and developed secondary phase voltages is (− 30 deg) or alternatively 210 deg between primary applied and secondary developed phase voltage. The relay is correctly connected by associating in each single-pole unit, currents and voltages displaced by 60 or 90 deg and giving the current an initial lead of 60 or 90 deg at unity power factor.

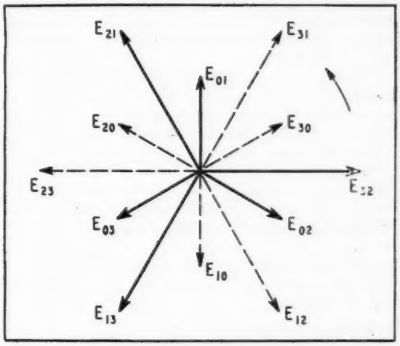



**Fig. 3.—Vector diagram for generator-load circuit**

Regarding earth-fault directional relays, both current and voltage coils must be connected through instrument transformers on the high-voltage side. Take, as an example, the current coil connected on the h.v. side to three C.T.'s in parallel, and the potential coil of the relay connected to

the open delta winding of the P.T. on the l.v. side, and assume that the star point of the power transformer is earthed and an earth fault occurs at " x " (Fig. 1a).

Through the current coil of the relay will flow the geometric sum of the line currents equal to the earth-fault current or three times the zero-sequence current, assuming the neutral of the source of supply to be earthed. The potential coil, however, remains de-energized since the geometric sum of the voltages line to earth on the l.v. side is zero because of the absence of zero-sequence voltage. The relay remains inactive and the faulty section of the network will not be isolated. If the potential coil is connected to the open delta winding of the P.T.'s on the h.v. side, the residual voltage applied to the terminals of the directional element is not zero and relay operation is ensured.

# Next Week's Events

**Monday, October 6th**

LIVERPOOL.—Royal Institution, Colquitt Street, 6.30 p.m. I.E.E. Mersey and North Wales Centre. Chairman's address by P. C. Barnes.

**Tuesday, October 7th**

LEEDS.—Corporation Electricity Department, Whitehall Road, 6.30 p.m. I.E.E. North Midland Centre. Chairman's address by E. S. Ritter.

MANCHESTER. — Engineers' Club, Albert Square, 6.30 p.m. I.E.E. North-Western Centre. Chairman's address by R. A. S. Thwaites.

LONDON.—The Oddfellows' Hall, 186, Hammersmith Road, S.W., 7 p.m. Association of Supervising Electrical Engineers (West London Branch). " Industrial Applications of Gas," by L. S. James.

LONDON.—At the Institution of Electrical Engineers, Savoy Place, W.C.2, 5 p.m. Institution of Post Office Electrical Engineers (London Centre). " Some Recent Developments in the Design of Short Wave Receiving Stations," by J. Neale and W. E. Adams.

LONDON.—Caxton Hall, Westminster, 7 p.m. Electrical Power Engineers' Association (London Technical Group). " Atomic Energy " by W. R. Wooten.

LOUGHBOROUGH. — The College, 6.30 p.m. I.E.E. East Midland Centre. Chairman's address by J. P. Tucker.

**Wednesday, October 8th**

ABERDEEN.—Caledonian Hotel, 7.30 p.m. I.E.E. North-East Scotland Sub-Centre. Chairman's address by D. J. Harvey.

BIRMINGHAM.—James Watt Memorial Institute, Great Charles Street, 7 p.m. I.E.E. South Midlands Students' Section. " Neon Lighting," by D. T. Thompson.

MANCHESTER. — Engineers' Club, Albert Square, 12.45 p.m. North Western Fuel Luncheon Club. Luncheon followed by the annual general meeting and presidential address by R. A. S. Thwaites.

**Thursday, October 9th**

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. Presidential address by P. Good.

DUNDEE.—Royal Hotel, Union Street, 7 p.m. I.E.E. North-East Scotland Sub-Centre. Chairman's address by D. J. Harvey.

**Friday, October 10th**

LONDON.—Caxton Hall, Westminster, S.W.1, 6.30 p.m. Electrical Power Engineers' Association (Southern Meter Engineers' Group). " Less Familiar Electrical Instruments and their Applications," by R. W. Griffin.

LONDON.—39, Victoria Street, S.W.1, 6.30 p.m. Junior Institution of Engineers. " Machinator: Quo Vadis ? " by L. S. Atkinson.

MANCHESTER. — Engineers' Club, Albert Square, 6.30 p.m. Manchester Association of Engineers. Presidential address by F. H. Williamson, followed by a smoking concert.

**Saturday, October 11th**

WAKEFIELD.—Association of Mining Electrical and Mechanical Engineers (Yorkshire North-West Branch). Discussion on Mr. Seymour's paper " The Performance and Characteristics of Three-Phase Induction Motors."

MANCHESTER. — Engineers' Club, Albert Square, 1.30 p.m. I.E.E. North-Western Students' Section. Annual luncheon followed by chairman's address by J. E. P. Mills.

## Wrongful Use of " A.M.I.E.E."

THE Institution of Electrical Engineers recently took action against Mr. A. M. Collis and secured an injunction against him restraining him from " using or permitting or procuring others to use after or in connection with his name on letter paper or other documents used in connection with the business of an electrical engineer or otherwise in connection with any such business the initials A.M.I.E.E. or any other initials or designation implying or calculated to lead to the belief (contrary to the fact) that he is a member of or otherwise connected with the plaintiffs." The defendant was also ordered to deliver up to the Institution all letter paper and other documents in his possession or power " the use whereof would offend against the foregoing injunction." Costs were awarded to the Institution.

# CORRESPONDENCE

*Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.*

## Non-Ohmic Resistors

IN his criticism of my letter, Mr. R. Wells overlooks the fact that the term "non-ohmic" is in common use and likely to stay. I gave reasons for accepting it, using the authority of Dr. Whitehead, an eminent mathematician. Mr. Wells objects to my deducing resistance from the amperes passing at a given voltage, but I submit that this is the only way when one is dealing with resistors which vary enormously with voltage as do the non-ohmic resistors. These permit only a small leak at normal voltage but act as valves to a lightning surge or similar violent effect, and one cannot use a Wheatstone bridge in conditions of this kind.

As to the word stability, I suppose that from one point of view the resistors are stable in that one can calculate the instantaneous current when one knows the instantaneous voltage, but if Mr. Wells had a rheostat made with resistors which varied in ordinary usage in the way that the non-ohmics vary when a surge strikes them, I think he might be pardoned for saying that they were unstable. The difficulty arises to find words which convey meanings accurately in all circumstances, thus the word sanction may mean either a permission or a prohibition.

*Newcastle-on-Tyne.* C. TURNBULL.

## Glass Insulators

THE article on "Toughened Glass Insulators" in your issue of September 26th might give the impression that it was not until the adoption of the toughening process that glass insulators became practicable for high voltages. Actually over thirty years ago glass insulators of the pin type for 15 and 45 kV were giving very satisfactory service in the north of France, in a district where the climatic conditions were comparable with those which prevail in many parts of England.

When serving with the B.E.F. in France during the "other war," I heard such a good account of their service, from M. Carrière, engineer to the Société Béthunoise, that I sent a sample glass high-voltage insulator to the University of Sheffield, strongly recommending that the matter of their use should be investigated with a view to their commercial manufacture and adoption at home.

Across the Atlantic, in the early days of power transmission, glass insulators for high voltage were tried, but they got a bad name because it was not recognized that to stand mechanical, electrical and thermal stresses, great care had to be taken in manufacture. In France the makers of champagne bottles used a glass which would stand high pressure, and one maker in particular, under the brand "Isorex," developed h.v. insulators of the pin type from a good grade of glass, carefully annealed, and in quite early days polarized light stress tests were used as part of the manufacturer's routine.

In daily use it was found that defective insulators could always be detected from the ground, and that it was not desirable to use ordinary Portland cement for the fixation of the pins, and so plaster-of-Paris with a little gum was generally used.

*Woldingham, Surrey.* THEODORE RICH.

## Potential Death Traps

IN your issue of September 26th Mr. G. E. Nicholls and "Reflector" point out once again some potential dangers of shoddy installations and unsatisfactory domestic appliances. Mr. Nicholls indicates that under existing conditions an appliance cannot be condemned until an inquest has taken place. Such procedure cannot be too strongly criticized. Electrical accidents in domestic circles are becoming far too prevalent, but the "powers that be" see no necessity for taking any special action.

Recommendations by coroners and juries are of little value. I have never heard of an electrical manufacturer or contractor being prosecuted for killing a person by an unsatisfactory appliance or a shoddy installation.

As the majority of electrical accidents are definitely preventable it is hard to believe that the authorities are so lackadaisical in such a vital matter. Unfortunately, all we can do in the meantime is to express our views in the strongest manner on every possible occasion.

*Glasgow.* ALEX MILNE, SENR.

# Ripple Control in Ayrshire

## System Embracing Seventy Towns and Villages

ON the evening of August 10th, when street lighting was restored throughout Great Britain, an installation of ripple control equipment, said to be the largest of its kind in this country, was brought into service by the Ayrshire Electricity Board. This "Rythmatic" ripple equipment utilizes the existing distribution network for remote control of water heaters for load-shedding as well as street lighting. The ripple control currents flow over the lines which carry the supply current and circulate through the step-up and step-down transformers.

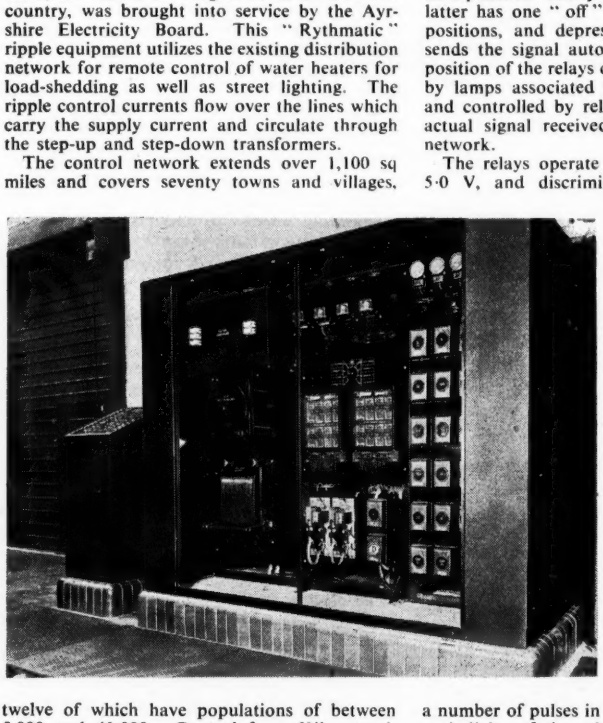
The control network extends over 1,100 sq miles and covers seventy towns and villages, twelve of which have populations of between 5,000 and 40,000. Control from Kilmarnock extends 28 miles in a northerly direction to Largs and 50 miles to Ballantrae in the south. Ultimately there will be over 10,000 relays.

Direct capacitor coupling for the ripple-frequency current is applied to the two sections of the 11-kV system, which current is fed from a motor-driven 50-kW, 585-cycle ripple alternator via a line-isolation transformer and tuning inductors to the capacitors. The maximum transformation of the ripple current is 11 kV, 22 kV, 33 kV, 11 kV, 3·3 kV, 240 V, i.e. five transformations.

The area is divided into four zones. Each has a separate "on" signal, and switching on is in sections to minimize the instantaneous load. Switching "off" is effected in two stages.

A sheet-steel cubicle houses all the control gear. The signals are initiated from a desk fitted with a "transmit" push-button and two nine-position rotary switches. Each of the latter has one "off" position and eight signal positions, and depressing the transmit button sends the signal automatically. The switching position of the relays on the network is indicated by lamps associated with each signal position and controlled by relays which respond to the actual signal received on the medium-voltage network.

The relays operate efficiently at from 0·4 to 5·0 V, and discriminate between signals by means of two types of filter, one mechanical and the other electric. These consist of a spring-controlled oscillatory galvanometer and an electrical resonant circuit respectively. The secondary mechanical filter also guards against interference. The resonant circuit accepts the signal frequency and rejects the 240-V, 50-cycle potential. The signal current is then rectified and applied to the galvanometer relay which, when energized, swings at the fixed periodicity or "rhythm" determined by its spring. When a number of pulses in harmony with the natural periodicity of the relay has been received, the swing of the armature builds up in amplitude to the point at which the galvanometer movement closes a contact, thus completing a circuit to a mechanically-locking switch which, in turn, performs the selected switching operation.



**Sheet-steel cubicle housing control gear**

The "Rythmatic" equipment was installed by the designers and manufacturers, Automatic Telephone & Electric Co., Ltd. We are indebted to Mr. Wm. C. Bexon, general manager and engineer of the Ayrshire Electricity Board, for permission to publish the above information.

**Machine Tool Exhibition.** — Next year's Machine Tool and Engineering Exhibition will open at Olympia on August 26th and close on September 11th. The exhibition will be international in scope.

# PERSONAL and SOCIAL

## News of Men and Women of the Industry

IT was announced on Tuesday that **Sir Stafford Cripps** has been appointed to the new office of Minister of Economic Affairs. He is succeeded as President of the Board of Trade by **Mr. J. H. Wilson,** Secretary for Overseas Trade. Mr. Wilson, who is thirty-two, becomes a member of the Cabinet. The Prime Minister is to preside over a new Ministerial Committee on Economic Planning which is being set up to cover both internal and external economic policy. **Mr. Herbert Morrison,** Lord President of the Council, is to continue to exercise co-ordinating functions in other economic matters and is to take over the duties of **Mr. Arthur Greenwood,** Minister without Portfolio, who has resigned. Further changes in the Government are to be announced later.

The British Electricity Authority announces that it has appointed **Mr. D. W. Coates,** C.B.E., M.A., LL.B., F.C.A., as chief accountant, and **Mr. E. R. Wilkinson,** M.I.E.E., as commercial manager.

**Mr. E. R. Wilkinson**

**Mr. D. W. Coates**

Mr. Wilkinson has been commercial manager of the Central Electricity Board since October, 1937. He received his engineering training at the Dick Kerr Works of the English Electric Co. and, after gaining practical works experience, concentrated on power station design, operation and production costs. For four years before joining the Central Board in 1928, Mr. Wilkinson was engaged with Merz & McLellan on power projects for various parts of the world and on many of the investigations into co-ordination of generation and standardization of frequency which preceded the Electricity (Supply) Act, 1926.

Mr. Coates has been chief accountant of the Central Electricity Board since it was set up in 1927. In addition to having had a varied experience in general practice, he was successively, in 1917 - 21, chief accountant, financial secretary and financial adviser to the Mines Department of the Board of Trade and, on the setting up of the Ministry of Fuel and Power in 1942, he was "lent" by the Central Board to the Ministry to be finance director of the Coal Division. Mr. Coates was honorary accountant of the Sea Fish Commission 1933-35 and a member of the Land Fertility Committee 1937-1941.

**Mr. T. V. Lironi,** deputy borough electrical engineer, Birkenhead, has been appointed acting electrical engineer on the retirement of **Mr. F. W. Brecknell,** the borough electrical engineer.

**Mr. W. L. Forbes** has been appointed a director of Andrew M'Robb, Ltd., Aberdeen.

**Mr. A. L. Mackillop,** director and joint general manager of C.A.V., Ltd., retired at the end of September after seventeen years' service. Before joining the company he was secretary to Arrol-Johnston, Ltd., Dumfries.

**Mr. J. A. Parker** has recently been appointed as Bristol branch manager for Graham Farish, Ltd. His office is at Perry Road, Park Row, Bristol (telephone: 26804). Mr. Parker has been with the company for some sixteen years, with exception of the time when he was a prisoner of war for four years.

**Mr. C. J. Elliott,** M.I.E.E., chief engineer to the Calico Printers' Association, Ltd., Manchester, retired on September 30th, after twenty-seven years' service. **Mr. J. H. Storrar,** A.M.I.E.E., A.M.I.Mech.E., deputy chief engineer, has been appointed to succeed Mr. Elliott as chief engineer.

**Mr. A. E. Cutler,** publicity manager with the Consolidated Pneumatic Tool Co., Ltd., has relinquished his position to take up an appointment as advertising manager with Blaw-Knox, Ltd. **Mr. H. S. Parsons,** assistant publicity manager with the Consolidated Pneumatic Tool Co., Ltd., has been appointed publicity manager as from October 1st.

**Mr. H. M. Dale,** of the Pyrene Co., Ltd., has been elected president and **Mr. T. F. Turner,** of the English Electric Co., Ltd., has been elected chairman of the Purchasing Officers' Association for 1947-48.

Personal circumstances have arisen which necessitate **Mr. G. C. Sutherland,** A.M.I.E.E., requesting the Electric Construction Co., Ltd., to cancel his engagement as representative for Scotland (announced in our issue of September 26th).

**Mr. G. T. Garwood,** engineer and manager of the West Hampshire Electricity Co., informs us that the staff of the Waitaki Electric Power Board, New Zealand, have sent him a number of food parcels for distribution among his own staff. **Mr. N. A. Brocklebank,** testing engineer to the Power Board, is understood to have been responsible for the happy suggestion

that the parcels should be directed to the staff of a sister undertaking in the old country.

A gift of £100 was recently presented on behalf of the Brush Electrical Engineering Co., Ltd., by Sir Ronald Matthews (chairman), to **Mr. H. Fraser** upon his retirement after sixty-three years of unbroken service with the company. Mr. Fraser joined the Brush Co. in 1884 and was employed as a rivet hotter for the boilers which the company built in those days. Later he became a specialized slotter and worked for forty years in the Brush dynamo shop. For the last nine years he has worked in the heavy engine department.

Weekly contributions of 7d. over a period of years by every employee at the Brush Electrical Engineering Co.'s works at Loughborough have gained them the ownership of their sports ground, one of the finest of its kind in the Midlands. At a recent ceremony the deeds of the property were formally handed over to the trustees of Brush Sports and Social Club by **Mr. A. P. Good,** the managing director of the company. Earlier, Mr. Good opened three new hard courts by playing one set of tennis with three members of the tennis section of the Club.

The Henley swimming gala held at the Plumstead Baths on September 19th included the final events for the City Livery Club competition. A cup, presented by the City Livery Club, is awarded annually to the department of W. T. Henley's Telegraph Works Co., Ltd., scoring most points in indoor and outdoor sports. The Gravesend works and North Woolwich works of the company drew on points, so it was decided by the toss of a coin that Woolwich works should hold the cup for the first six months of the year, and Gravesend for the second. **Sir Montague Hughman,** chairman of the Henley organization, handed the cup to Mr. A. W. McArthur, works manager of the North Woolwich works.

## Obituary

**Mr. E. T. Goslin.**—We regret to record the death of Mr. Ernest T. Goslin, former supply contracts manager to the Central Electricity Board, which occurred on September 23rd at his home at Northwood, Middlesex. Mr. Goslin commenced his career with Crompton & Co., Ltd., and after holding other positions in England went to Glasgow where for twenty years he was in the service of the Corporation Transport Department, eighteen as chief electrical engineer. In 1920 he was appointed general manager of the Clyde Valley Electrical Power Co., a position he held until the end of 1932 when he resigned for health reasons. He served on the C.E.B. Technical Consultative Committee for Scotland and in June, 1933, became supply contracts manager to the Board, from which position he retired in 1943. Mr. Goslin became an associate of the Institution of Electrical Engineers in 1897 and had been a full member since 1910.

## Hartshead Power Station Extended

IN commemoration of the twenty-first year of its operation, a 31,500-kW extension of the Hartshead generating station of the Stalybridge, Hyde, Mossley and Dukinfield Transport and Electricity Joint Board was officially inaugurated on September 25th, bringing its capacity up to 100,250 kW. A further similar generating unit is scheduled to be installed by June, 1950.

Ald. Sir William Walker, who had formally inaugurated the extension, said at the subsequent luncheon that no other industry had shown anything like the technical advances that had taken place in the generation and distribution of electricity. Most of these advances had been made in this country, and the value of the research carried out here was admired by foreign engineers. Experiments now in hand would double the voltage of transmission to 264 kV. If there had been more voluntary amalgamations on the lines of the Joint Board, he believed later developments might have been different.

### Advantages of Co-ordination

The growth of the undertaking was surveyed by Ald. G. H. Pickthall (chairman of the Joint Board), who expressed concern at the possible loss of revenue by the four corporations which owned the system. Sir John Kennedy (chairman, Electricity Commissioners) replied that the advantages of co-ordination had been illustrated by the four authorities, and would be achieved on a larger scale under the new arrangements. The considerable rate reliefs mentioned by the previous speaker presumably indicated that consumers of electricity had paid more than they need have done. Mr. J. Eccles (president, I.M.E.A.) suggested that the Joint Board would no doubt agree that the benefits they had enjoyed should be made available to the rest of the country. Ald. F. D. Ashton (chairman, Joint Board Electricity Committee) stated that the capital costs of the three earlier extensions had been £8·7, £10·5 and £14·5 per kW. He urged that under nationalization close touch should continue to be maintained between those who supplied and those who used electricity.

Principal contractors for the new plant were: Turbo-alternator, Metropolitan-Vickers Electrical Co.; switchgear, G.E.C. and Ferguson, Pailin; auxiliary switchboards, Cooke & Ferguson; control gear, Brookhirst Switchgear and Metropolitan-Vickers Electrical Co.; cables, W. T. Henley's Telegraph Co. and Pyrotenax; boiler plant, Babcock & Wilcox; superheaters, Superheater Co.; economizers, E. Green & Son; instruments, Geo. Kent; feed pumps, Mather & Platt; coal-handling plant, Mitchell Engineering; ash-handling plant, International Combustion.

# I.E.E. Centre Chairmen—II

## Further Biographies of Officers for 1947-48

THE Southern Centre chairman of the Institution of Electrical Engineers is **Mr. D. Dyson Rayner,** assistant engineer on the electrical side (generating station construction) with the Portsmouth Corporation Electricity Department. Mr. Rayner was educated at Bradford High School and Bradford Technical College and received his training with the Phœnix Dynamo Co., Ltd., and in the test and drawing office of Veritys, Ltd. In 1912 he joined Wilson Hartnell & Co., Leeds, with whom he was a.c. designer and works manager, and in 1914 he was appointed assistant engineer and a.c. designer with the Electric Construction Co., Ltd., Wolverhampton. In 1919 he founded his own business and afterwards became associated with the late J. P. Hall & Co., Ltd., Oldham, as general manager. He was appointed technical sales engineer with Brookhirst Switchgear, Ltd., in 1930 and joined Crompton Parkinson, Ltd., in 1936, as works manager at the motor works, Guiseley, near Leeds. From 1940 to 1946 he was electrical engineer with the Admiralty at H.M. Dockyard, Portsmouth, in charge of electrical workshops (National Service) after which he took up his present position at Portsmouth. Mr. Rayner is an associate member of the Institution of Mechanical Engineers. He has been a frequent contributor to the technical press on electrical equipment and power installations.

**Mr. D. Dyson Rayner**

**Mr. W. S. Burge,** chairman of the South Midland Centre, is manager of the Central England District of the Central Electricity Board. He spent the first fourteen years of his career obtaining practical experience in the manufacture, erection and operation of power station plant. During this period he was with C. A. Parsons & Co., Dick Kerr & Co., the B.T.H. Co., A. Reyrolle & Co., Ferranti, Ltd., and the Electricity Departments of Wakefield and Southampton Corporations. In 1915 he volunteered for service with the Royal Engineers with whom he attained the rank of captain, and on demobilization in 1919 joined the staff of the English Electric Co., Ltd., and specialized in steam turbine work. He visited the United States in 1926 as a member of the steam turbine panel of the International Electrotechnical Commission, and again in 1928 on behalf of the English Electric Co. He was appointed operation engineer with the Central Electricity Board in the South East England District in 1930, being promoted to deputy manager in 1940. He took up his present position in 1942.

**Mr. W. S. Burge**

**Mr. J. P. Tucker**

**Mr. J. P. Tucker,** who is chairman of the East Midland Centre, is borough electrical engineer of Loughborough. He was educated at Torquay Pupil Teachers' Centre and was apprenticed in general engineering at Torquay. He studied at Loughborough College, where he obtained a diploma with first class honours in electrical engineering. He joined the Yorkshire Electric Power Co. in 1923 as operation and district engineer, and in 1933 became the first engineer and secretary to the Isle of Man Electricity Board. He took up his present position at Loughborough in 1936.

## Batti-Wallahs' Society

SOME interesting facts relating to the history and customs of the Livery Companies of the City of London were given by Mr. E. P. Angus at last week's luncheon of the Batti-Wallahs' Society. Col. H. J. Wellingham, the president, in introducing Mr. Angus, mentioned that he was a member of the Goldsmiths' Company and was therefore well qualified to speak upon the subject. Mr. Angus said that the Companies commenced as religious bodies or trade associations with a strong religious character, which were formed into Companies to protect the interests of their trades. To-day there were over seventy whose interests were now chiefly of a charitable and educational nature. Many maintained their own grammar schools. He mentioned the large contributions made by the Clockmakers' and Goldsmiths' Companies to the City & Guilds of London Institute.

Commander S. Harper-Bill, himself a member of the Horners' Company, in proposing a vote of thanks to Mr. Angus, mentioned that two years ago the Horners' Company invited the plastics industry to join the Company. The next luncheon will be on October 30th, when Dr. T. E. Allibone will be the principal guest.

# RECENT INTRODUCTIONS

## Notes on New Electrical and Allied Products

### New Ships' Cable

A NEW type of cable for wiring ships was shown for the first time at the Engineering and Marine Exhibition by BRITISH INSULATED CALLENDER'S CABLES, LTD., Norfolk House, Norfolk Street, Strand, London, W.C.2. It is insulated with varnished cambric and has a polychloropene ("PCP") sheath, which is taped and braided. The compound is used as an alternative to lead and is applied by means of a rubber extrusion machine similar to that employed for covering t.r.s. cable.

The principal advantage of the new cable, which has just been approved by Lloyd's, is weight reduction, for a typical installation is about 40 per cent lighter overall than the lead equivalent. It is also to some extent fire resistant, so helping to minimize and localize the risk. The use of varnished cambric insulation permits the conductor to be operated at a higher current density than is advisable when the insulation is vulcanized rubber, although not so high as when the cambric is sheathed with lead. The flexibility of the new cable makes it definitely easier to install and the resilience of the "PCP" sheath is a safeguard against mechanical damage.

### Precision Speed Indicator

An instrument designed to provide an absolute standard of speed measurement is made by the BRITISH THOMSON-HOUSTON CO., LTD., Rugby, for aero-engine testing and similar purposes. It is self-checking and indicates at a distance by means of a spot on a scale; the accuracy is "permanent," errors not exceeding 0·1 per cent.

The instrument is operated by the output frequency of a small a.c. generator, of the permanent magnet type, which is coupled to the rotating member to be tested. Voltage and wave form have no effect whatever on the accuracy while the frequency is unaffected by temperature. The circuit is a derivation of the Maxwell commutator bridge. The frequency, varying according to changes of speed at which the alternator is driven by the rotating member, operates a high-speed relay that injects a fixed current (derived from a dry battery through a very accurate standard condenser) into the measuring circuit once per cycle. The mean current is therefore proportional to the frequency and hence to the speed.

To facilitate reading the 10-in. scale with precision, the total range is divided into four sections (any one of which may be selected at will) which has the effect of multiplying the scale length by four without loss of accuracy. When great accuracy is not necessary a selector switch marked "Sensitivity" brings into use a second scale that compresses the total range into one traverse of the spot. The readings are to some extent dependent on the dry battery, but a switch marked "Standardize" enables a rheostat to be used for adjusting the calibration in respect of both battery and temperature variations.

To avoid parallax errors and risk of damaging mechanical parts a damped light spot reflecting system is used instead of an indicating pointer. The number of poles of the driven alternator may be changed from two to 24, so varying the speed range from 1,000 to 12,000 r.p.m., or from 4,000 to 48,000 r.p.m. when the alternator is driven at a four-to-one reduction gear ratio to the indicated speed. The same indicator may (to vary the scale range) be used with several different generators, or even with amplified electrical pulses. The length of connecting lead is not material. This instrument is believed to be the most accurate tachometer ever made.

### Heating Equipment

Two kinds of all-electric "unit" heaters are being made in three sizes by CARTER & CO., LTD., William Street, Nelson, Lancs. There is the louvred box type constructed of sheet metal welded on to angle-iron framework with an adjustable swivel arm for suspension from factory roof girders. Air is blown through the nickel-chrome heating elements, of 5 or 10 kW, by a four-bladed fan driven by a ¼-h.p. motor, 230-V single-phase or 400-V three-phase. A thermostat with auxiliary contactor can be provided to protect or regulate the heater.

A smaller model for office use is of 2½ kW. This is circular with a wire-mesh front and can be mounted on a wall bracket as an ordinary fan.

A wall-panel heater designed to combine radiation with convection is announced by the ERALITE MANUFACTURING CO., LTD., 194, The Broadway, London, S.W.19. The upper portion of the shell, which is enamelled in colours, contains a chromium plated non-ferrous reflector below which is a louvred enclosure containing two 750-W elements individually controlled by double-pole 5-A switches. Export inquiries should go to the works at Congleton.

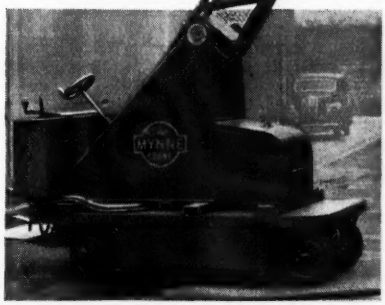
### Movable-Arm Lighting Fitting

A local lighting fitting of the all-angle arm type is being made at the "DUALIT" WORKS, 27a, Picton Street, Camberwell, London, S.E.5. It remains in any desired position without adjustment, or locking, by virtue of a totally enclosed compensated balancing parallelogram system. It has a universal swivel base for screwing or clamping to a desk or machine.

# Mobile Crane

## Convertible to Truck by Removing Jib

FOR dealing with a variety of loads in different circumstances, facilitating the loading and unloading of railway wagons and road vehicles, or stacking purposes, the 10-cwt "Mynne" runabout crane introduced by Crompton Parkinson, Ltd., and C. H. Johnson (Machinery), Ltd., has been developed for operation by the class of labour normally employed for handling heavy goods. A jib crane is mounted on a 2-ton "Electricar" truck of a type specially designed for manœuvrability, with a speed of 4½ m.p.h. and a long wheel base to ensure complete stability. The maximum overall height of the jib is 15 ft 6 in. and the minimum clearance height 6 ft 9 in. The maximum ground to hook height is 13 ft and when a load of 10 cwt is being lifted the maximum permissible radius of operation is 9 ft, but it increases when lighter loads are dealt with and 6 cwt can be handled at a radius of 13 ft. Safe load and radius indicators of the drum type are fitted to the carriage king posts,



"Mynne" battery crane

so as to be easily visible from the operator's platform. They are worked by the jib spindle and indicate the radius on one side and the safe load on the other. The hoisting speed of the crane is 60 ft per minute.

The crane with the truck weighs 2 tons 12 cwt. Both the lattice type jib and the carriage are of welded construction. The hoisting machinery is enclosed in the carriage. A ¾-h.p. totally enclosed motor drives the hoist through a directly coupled totally enclosed fan-cooled worm reduction gear box. An electro-magnetic brake acts on the periphery of the coupling. The drive from the gear box to the drum is through a pair of machine-cut spur gears. The drum itself is of close grain grey iron, with machine-cut rope grooves and deep flanges. It is mounted on a mild-steel shaft running in ball bearing plummer blocks.

For hoisting and lowering there is a reversing drum type controller with three steps in each direction. It is fitted with an in-built self-resetting circuit-breaker which, in the event of overwinding, is tripped by a hoist limit switch attached to the jib cat-head and operated by a ball on the fall.

The working parts are enclosed for safety and exclude dirt and moisture, but where easy access for maintenance is essential the sheet-steel enclosure plates are fitted with quick-release fasteners.

The jib is mounted on pivot bearings bolted to the king post of the carriage and its rear end is fitted with sheaves around which the luffing rope is arranged to form a double purchase. A hand wheel drives the jib luffing drum through a worm gear and the drum is fitted with a pawl and ratchet.

A 320-Ah battery provides power for both the hoist and the truck motors. It is in two sections, fitted into sliding carriages with roller bearing supports for quick servicing.

A special feature is that the crane can readily be removed from the truck, which can then be used separately, the hoist motor being connected to the control cubicle through a special withdrawable plug so that no permanent connections have to be undone.

One full charge of the battery allows for about ten hours' operation. An earlier type of a similar crane has been operated for several years by a firm of stevedores. With about twenty cranes in service, over 30,000 tons are handled each month. Eight cranes used in a factory and operated by girls handled some 146,000 tons of material during one year at an average maintenance cost per crane of 1s. per working day.

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## Financing Bulgarian Scheme

A Bill which would provide for a Bulgarian National Bank fund for national economic rehabilitation, and particularly for an electrification programme, is to be submitted to the Bulgarian Parliament.—*Reuter.*

# South African Plant Needs

## Electricity Supply Commission's Extending Activities

REPORTING a continued increase in the electricity demand from all classes of consumers during 1946, the Electricity Supply Commission of South Africa states that it was possible to comply with only a fraction of the applications received for new connections and extensions. Most of the Commission's stations have operated at maximum capacity and the position as regards new plant, replacements and repairs, although showing some improvement on the previous year, remained difficult. Plant on order from overseas is already long overdue and the earliest delivery offered for generating plant is between two-and-a-half and three years.

Besides extensions in hand at the Colenso, Congella and Vaal stations aggregating 98,000 kW, a new station is to be constructed at Worcester with an initial installation of 60,000 kW, to be increased later to 100,000 kW. Further requirements are likely to ensue from the setting up of three new undertakings. The Greater Rand Extension Undertaking, for example, covers an area of 16,000 square miles which includes the new goldfields of the Orange Free State, diamond and other mines, cement works, etc. It is estimated that six or eight new gold mines in the O.F.S. will require 100,000 kW by 1955, in which case it may be necessary to build a new power station. Further, in the new Border Undertaking the East London Municipality is transferring to the Commission a site for a new station adjacent to the existing one. A third new undertaking is likely to be set up in the Kimberley area. Extensions are also in progress at the Table Bay power station of Cape Town Corporation which is associated with the Commission under a pooling agreement.

### Supply to New Goldfields

The Commission now owns approximately 2,939 route miles of transmission lines and cables. New lines under construction include one of 88 kV from Coalbrook to the new goldfields in the O.F.S. (about 120 miles), another 88-kV line from Blyvooruitzicht gold mine on the Far West Rand to Mafeking (over 125 miles) and a 40-kV line from Olifantsfontein on the Germiston-Pretoria Railway to Premier Mine (30 miles).

The aggregate capacity of plant installed in the Commission's main power stations at December 31st last was 985,650 kW, including 424,000 kW at Klip and 139,000 kW at Vaal. A total of 5,178 million kWh was generated, exceeding the previous year's figure by 316·6 million kWh (6·5 per cent). Coal consumption per kWh sent out varied from 1·510 lb (average B.Th.U. 12,330) at Congella to 1·801 lb (average B.Th.U. 9,140) at Klip. The best thermal efficiency was the 22·48 per cent achieved at the Vaal station, followed by 20·73 per cent at Klip. At the latter station coal cost only 4s. 4d. a ton of 2,000 lb, but even this figure surpassed the cost of fuel at Witbank (2s. 9d. a ton). The highest price paid was 25s. 9d. at Salt River. It is worthy of note that, with the exception of Klip, the coal costs are within a few pence of the prices paid ten years ago.

Sales of electricity generated and purchased totalled 5,002·4 million kWh (6·3 per cent increase) of which 3,813·1 million was supplied in bulk for mining, etc. The average price received per kWh sold was 0·191d., compared with 0·186d. a year before. Total revenue amounted to £4,100,361 (£3,770,631) and after meeting production costs, including interest, redemption and reserve fund charges, there was a net profit of £4,702 against a deficit of £17,123 in 1945. The reserve fund at December 31st stood at £2,202,165 and the redemption fund at £7,094,645. The market value of investments held by the Commission was £10,134,353. Expenditure on capital account during the year amounted to £1,469,648, bringing the total up to £26,426,396.

An appendix to the report of the Commission (chairman, Dr. H. J. van der Bijl) shows that according to the 1944–45 Industrial Census 8,328·5 million kWh was generated in the Union, consumers numbering 400,356.

# Australian News

A REPORT from our Australian correspondent, dated September 4th, states that the second half of a frequency changer weighing nearly 60 tons and two cases of frequency change equipment weighing 26 tons and 24 tons respectively have been unloaded at Fremantle from the motorship *Kaituna*. The gear came from Britain and is for the East Perth power house. On the same vessel was a 45-ton transformer for the new South Fremantle station.

The Prime Minister (Mr. Chifley) recently said that although the High Commissioner in London (Mr. Beasley) was doing everything in his power to secure new plant for the Bunnerong, New South Wales, power house, it seemed that efforts would also have to be made to secure this from the United States.

**Domestic Appliances.**—A new cordless type of electric iron is meeting with success in Australia, but at a retail price of over £7 is regarded as somewhat expensive.

Consideration is to be given by the Customs Department to applications for licences to import electric kettles from the United Kingdom, provided the applications are accompanied by definite evidence of availability. Applications must show the number as well as the value of kettles it is desired to import.

# Technical Handbooks

## Essential Service to Customers

**By John H. Jupe,** A.M.I.E.E.

AN important aspect of a manufacturer's duty to the customer is the preparation and supply of suitable technical handbooks and the establishment of goodwill, particularly in overseas markets, depends much on the fulfilment of this obligation. Yet there is probably no branch of engineering which is more neglected.

In general, most firms handle the subject in one of four ways: 1. No written information is supplied at all. 2. A sales or contracts clerk is told to assemble some leaflets or brochures into a binder. In many cases they are not exactly applicable to the equipment being shipped but this is commonly ignored. 3. A responsible engineer hurriedly dictates some notes on essential maintenance. The compilation is usually regarded as an annoying triviality and is put off until after the equipment has been shipped. 4. Full-time writers with a substantial technical background are employed to prepare comprehensive manuals.

### High-handed Attitude

Method 1 needs no comment except that firms who adopt it deserve failure to obtain repeat orders. It may be claimed that "Messrs. X are well established and they *never* issue anything." This is perhaps true but all the same the firm may be cursed a hundred times a year by engineers who are condemned to "feel" their way around Messrs. X's products because of the lack of proper technical information. There may be adverse comments on the quality or design of the goods, when incorrect maintenance because of lack of instructions is the real cause of the troubles. Where overseas buyers and highly competitive markets are concerned these things are remembered when replacements or additional plant are needed.

Methods 2 and 3 certainly give the customer some information but they are defective, though in different ways. The literature assembled by the contracts clerk is necessarily a collection of standardized statements and will almost certainly cause annoyance by its failure to give guidance on points most needed, and in other ways. It will describe, for example, how to dismantle type "A" equipment when type "B" is actually being supplied, and nothing is more annoying (or sometimes perplexing).

Notes prepared by engineer-designers are generally on a higher technical plane than the stock assemblies, but often the writer omits much important information because he considers it too trivial for inclusion; he judges his readers by his own well-informed standard. Then information of a highly theoretical nature is often included with the severely practical, e.g., a discussion of vector relationships in windings may be followed immediately by a warning that the coils must not be removed from the oil for long periods. Why good engineers should be so illogical is hard to explain but it is not an infrequent occurrence.

The employment of a full-time technical writer is obviously the best way since it removes the task from the spare-time category and there is every reason why the person responsible should make a study of the subject in order to get a balanced perspective. The writer must possess a technical background which places him in the "senior" grade of personnel, so that he can appreciate intricate technical points, but at the same time he will not be biased by technical achievement and give undue prominence to what is only a means to an end.

He must know exactly what is required in a practical sense and must be able to understand the equipment from the user's point of view and to answer any question the customer may ask at any time in the life of the plant. Finally he should be paid a salary commensurate with these qualities.

### Importance of Good English

The ability to write good, clear and concise English is important. It can be acquired without tremendous effort, yet surprisingly few engineers bother about it. Many men of quite high technical standing are incapable of preparing good reports and often fail to make their meaning clear when writing, as the following examples will show:—

> ". . . If a metal plinth is not supplied it should be made of wood about 3 in. by 3 in. in size."

". . . It comprises a steel cabinet 32 in. wide and 6 ft 10 in. high and fitted with rear doors, into which the following chassis units slide on runners."

". . . controls situated on the power control board, the supply unit and finally the operator's desk, where the main high tension supply is applied."

It is essential that the writing of the handbook should be regarded as an important operation in the production of the equipment and that a responsible executive should insist that no contract is complete until a proper handbook has been supplied. A primary step in achieving this is that the writer shall be given proper facilities to attend production conferences, to examine the equipment and, if possible, to spend time in assisting to test it. Only by these means will he get a real grasp of its intricacies. Yet these points are often overlooked and it is assumed that the examination of a few blue-prints and the services of a stenographer are sufficient to enable a comprehensive technical instruction manual to be written.

Next comes the question of the contents of the handbook and an attitude which should be quickly dismissed is that the customer or his employees are fully trained and do not need to be told very much about the new plant being purchased. This is an unwise assumption, since responsible engineers may be unfamiliar with a particular type of machine, apart from those who will be responsible for installation and operation. There is also the matter of training juniors to be considered.

### Suggested Arrangement

Few engineers resent being reminded of what they already know but to keep them in ignorance of what may be regarded as essential data is to invite adverse opinions. What constitutes "essential data" is hard to define and the safest plan is to supply a comprehensive document, irrespective of whether it runs to four or forty pages.

The book should start with a statement of what the equipment is and what it does, with a brief list of main features and performance figures. This will enable the reader to get a good general knowledge of the apparatus in a few minutes, a matter appreciated by busy executives as well as by the engineer who is actually in charge of installation.

The subsequent chapters will need varying according to the equipment but the following are useful suggestions: Detailed description, electrical, mechanical, etc.; power supplies, if the equipment has a complex power distribution system; control circuits; preparation for installation, including the method of unpacking, etc.; installation, wiring and lining up; testing and putting into service; operation; maintenance; fault location and repair.

### Points to be Observed

Although precise details of the chapters cannot be generalized there are certain points of importance:—

1. If possible, drawings and sub-units should not be referred to by code numbers, which mean very little to the installation engineer. The former can well be stamped with fig. numbers and the latter are better referred to by name. Coding should only be used if it is very clearly marked.
2. At all costs ambiguous statements should be avoided and the chapter on testing and putting into service can well consist of a series of numbered instructions set out in the form of direct orders.
3. The chapter on operation should cover the normal day-to-day use of the plant as against the first testing given in the previous chapter.
4. The chapter on fault location can be as comprehensive as is thought necessary but should certainly contain a list of simple faults, preferably related in some way to the starting sequence of the plant. Many simple faults may be classed as "obvious" but irrespective of the technical standing of an engineer he appreciates a list of the most likely faults, so that he can run through it without hesitation in times of emergency or breakdown.
5. Somewhere in the book a complete list of fuses should be given, also all tappings of all transformers, etc. The latter information may not be essential in using the equipment but the customer is entitled to such data for reference purposes.

Full and clear information concerning the ordering of spare parts is very important. Where to look for the type and serial number of a machine, how to identify or describe a component part, and the address to which the spare part should be sent, are matters which should be given special attention.

# COMMERCE and INDUSTRY

## Winter Fuel Economy Campaign. Type-Testing Electric Cookers.

AT a press conference last week Sir Guy Nott-Bower, Deputy-Secretary, Ministry of Fuel and Power, explained the Ministry's plans for the winter fuel economy drive. He said that there would be no compulsory restrictions on domestic consumers of electricity and gas this winter and that the ban on electric and gas fires would disappear during the winter months. The Government would rely on voluntary saving. Domestic consumers were going to be largely responsible for the way in which the danger of load shedding was met next winter, and he appealed to them to remember the peak periods between 8 a.m. and noon and between 5 p.m. and 6 p.m.

Referring to the position of coal stocks, he said that at power stations the overall stocks of coal were about five and a half weeks' supply against just over three weeks' supply at this time last year. The total at gas works was four and a half weeks' supply, as compared with two and three-quarters last year. The Ministry was not proposing to have a poster campaign run from headquarters, but would decentralize the campaign down to the local authority areas. Joint fuel economy committees were being set up in local areas and 400 of these were already in operation; it was hoped to double that number. Inaugural meetings would take place all over the country during the next few weeks.

### Testing N.H.D. Cookers

The British Electrical Development Association has offered the Ministry of Supply the resources of the proposed E.D.A. Testing House for the purpose of type-testing all electric cookers under the N.H.D. (National Housing Drive) Scheme. Until the Testing House is established it is suggested that use should be made of the testing facilities of the member undertakings under the auspices of the Testing House Committee.

Previously it had been proposed by the Ministry of Supply that its Chief Inspector of Electrical and Mechanical Equipment should do the testing of electric cookers. As, however, the Government had accepted Watson House tests in the case of gas cookers, it was suggested by joint meetings of E.D.A. and B.E.A.M.A. committees that the electrical industry should make some similar arrangements with its own testing standards, rather than allow a Government to put up its own form of test. The Ministry of Supply has already prepared a draft testing specification, but the E.D.A. Cooking Sub-committee and the Standing Committee of the B.E.A.M.A. Domestic Cooker Section are jointly to prepare a testing specification, incorporating the relevant British Standard Specifications.

### Bethnal Green Mobile Showroom

A mobile trailer unit presented by the W.V.S. at the end of the war is being put to good use by the Bethnal Green Electricity Department for demonstration purposes, particularly when new houses or blocks of flats are opened. As the accompanying E.D.A. photograph shows, a remarkably comprehensive display of apparatus has been accommodated in the limited space of 9 ft by 6 ft by 6 ft (12 ft with side curtains). Equipment includes a cooker, kettle, 1½-gal. water heater, 20-gal. U.D.B. water heater, 8-in. wall clock and pump. The three lighting points, three 15-A switch sockets and cooker control unit are all connected to a standard block dwelling type "Mantel" consumer's supply control unit, with micro-gap switch and fuse assembly. Demonstration meters are also installed.

**Mobile demonstration showroom now being used at Bethnal Green**

### Cable Makers' "Staggered" Hours

To meet the conditions created by the alteration of working hours to reduce electricity demand, the National Joint Industrial Council for the Electrical Cable Making Industry has come to an agreement with regard to wages. This provides that the normal hours per day and per week and current overtime conditions

shall be maintained. Provided the hours worked per day do not exceed the new range of normal hours, which in total will give a 44-hour week (including Saturday mornings, if worked) hours between 7 a.m. and 8 p.m. will be paid for at normal rates. Time outside these hours will be paid for as overtime. Where it is not possible to complete the normal working week in five days, it will be permissible to work on Saturday morning, hours between 7 a.m. and 12.30 p.m. being treated as normal day time.

Payment under night shift, double day-shift and three-shift systems will be in accordance with the current agreements.

## Load Spreading at Luton

Finding that many consumers in the area had rather vague ideas of the Government's requirements in the matter of reducing the industrial demand for electricity, the Luton Town's Committee of the Eastern Regional Board for Industry has prepared a booklet explaining in simple terms the need for "staggering" the load and the method to be adopted for meeting the need. From the copy which has been received from Mr. C. T. Melling, the Luton borough electrical engineer, we see that the means of reduction suggested include the installation of private plant, the transfer of heavy plant loads to night shifts and the operation of shifts, and details of many ways in which economy can be achieved in consumption are set out.

## Broadcasting Station Guide

The demand for the *Wireless World* guide to the world's broadcasting stations first published last January has necessitated a third edition. It gives details of 300 European medium- and long-wave stations and a thousand short-wave stations in order of frequency and alphabetically with other related information. Copies 1s. each (postage 1d.) can be obtained from the publishers, Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1.

## Research in Industry

The *Board of Trade Journal* is publishing a series of articles on research in the leading British industries. In the issue of September 27th, Dr. S. Whitehead, director of the British Electrical and Allied Industries Research Association, deals with research in the electrical industry. He briefly describes the "set-up" of E.R.A. and refers to work on the improvement of materials, the development of plastics and high-temperature insulation. He also deals with lighting, heating, safety and radio interference.

## Price Maintenance Inquiry

The President of the Board of Trade has set up a committee "to consider the practice by which minimum wholesale and retail prices or margins for the resale of goods are fixed by producers and its effects on supply, distribution, and consumption, and to report whether, in the light of present conditions, and particularly of the need for the maximum economy and efficiency in the production and distribution of goods, any measures are desirable to prevent or regulate its continuance."

## Registered Electrical Contractors

It is noted in the September issue of *Registration* (the official review of the National Register of Electrical Installation Contractors) that the Executive Committee, which has hitherto done the regular work of the Register, is being dispensed with and in future the Registration Board will meet monthly to deal with the business. The Scottish Committee is being re-established and representatives have already been appointed by Scottish electricity supply authorities, the E.C.A. of Scotland and the I.M.E.A.

This issue of *Registration* also contains notes on water-heating installations, legal rights and obligations and co-operation of contractors with supply undertakings.

## Fuel Saving Appeal

Mr. Shinwell, Minister of Fuel and Power, is to ask a conference of representatives of seventy-six local authorities in the Midland Region, at Birmingham on October 8th, for their co-operation in achieving maximum economy next winter in the consumption of electricity and gas in homes, shops, cafés and hotels. More than half the authorities invited have already set up working committees designed to encourage domestic and non-industrial fuel economy, and all except seven of the remaining authorities have announced their intention of setting up similar committees. Mr. Shinwell will indicate the lines on which he suggests committees should work to reduce domestic consumption at times when industrial consumption is at its peak.

## Illumination Design Courses

The fiftieth Illumination Design Course organized by the Lighting Service Bureau of E.L.M.A. which commences on October 13th at 7 p.m. is a refresher course for the electrical industry. The lectures will be given at the Lighting Service Bureau, 2, Savoy Hill, W.C.2, on consecutive Monday evenings for six weeks ending November 17th. Similar courses are being held at Victoria Hall, Norfolk Street, Sheffield, from October 8th to November 12th (Wednesday evenings) and at the Corporation Electricity Supply Showrooms, Paradise Street, Birmingham, from October 14th to November 18th (Tuesday evenings).

## Luton Electrical Society

The first ordinary meeting of the 1947-48 session of the Luton Electrical Society will be held on November 6th, when Mr. C. T. Melling

will speak on "Electricity and the Power Crisis." On February 3rd the speaker will be Mr. G. Cosgrove, whose subject will be high-frequency heating. Mr. L. H. Hubble will speak on March 9th on electric lighting, and on April 6th the annual general meeting will be held. All these meetings will be at the Assembly Room, Town Hall, Luton. Informal meetings will be held at the Technical College, Luton, and include the following:—October 7th: Mr. D. M. Adams on radiant heat. November 25th: Mr. F. Midgley on earthing. December 16th: Mr. A. W. Blandford on h.r.c. fuses and switchgear rupturing capacities. January 6th: Mr. L. E. Tremayne on plant breakdowns. February 24th: Messrs. L. R. Perkins and E. J. Sutton on wiring. March 23rd: Mr. B. E. A. Vigers on electro-chemistry.

## Lamp Publicity

Extensive press advertising, new window display backgrounds and a selection of show cards will form the new season's campaign of the General Electric Co., Ltd., for "Osram" lamps. Space has been taken in the principal London newspapers, the leading provincial evening papers, popular magazines, and motoring journals. These will be backed by advertisements in the industrial technical press. Two entirely new backgrounds have been produced for the "Osram" window dressing scheme which will be operated for the G.E.C. by the City Display Organization. The first incorporates a new departure in that the main display panel is suspended by cords stretched across the window. Thus the retailer can display material in the front of the window without obscuring the panel. The second display incorporates an attractive screen, brightly printed in eight colours, with "Osram" in red on a yellow background. Each of these displays makes use of a neat cardboard cut-out which embodies the new design of lamp carton.

Some of last season's showcards have been retained while a new one has been introduced for photographic lamps. In addition, there is an effective one-piece stack of cartons.

"Metrovick" lamp display piece

The Metropolitan-Vickers Electrical Co., Ltd., is again using the slogan "When daylight fades . . . . switch to Metrovick and Cosmos Lamps." Press advertisements, in addition to displaying pictures of lighting installations designed by the company's illuminating engineers, will carry reproductions of black and white sketches emphasizing the slogan. Catalogues, folders and leaflets are again available, including the familiar orange covered lamp catalogue. As prices and designs become stabilized more extensive catalogues are replacing the leaflets and folders started as a wartime makeshift. Window display materials are scarce so that a small quantity only of displays will be available. There are two display pieces, one 5 ft high opening to 10 ft and a smaller one 2 ft 9 in. high opening to 4 ft wide. This year the well-known lamp calendar is breaking its long tradition with a charming brunette accompanied by a friendly "Scottie."

An "Osram" lamp window display incorporating an attractive screen

## Hire-purchase of Refrigerators

Following discussions with the British Refrigeration Association the British Electrical Development Association has decided that it is premature to consider standard terms for the hire-purchase of refrigerators.

## Examination in Sales Management

The Education Committee of the Incorporated Sales Managers' Association has recommended that a second examination in sales management shall be held in December. The examination, for both qualifying and final stages, will be held on December 4th, 5th and 6th in centres

which will be determined by the number of entries. Entry forms are now available from the secretary of the Association at 23, Bedford Square, London, W.C.1, and must be returned by October 31st. The Association's examination in salesmanship will not be held in December.

## Accident Prevention Congress

The Royal Society for the Prevention of Accidents is holding its silver jubilee congress from October 7th to 10th at Brighton and Hove. Among the speakers will be Mr. H. W. Swann (H.M. Senior Electrical Inspector), who will speak on " Electrical Accidents in the Home," and Mr. R. R. Lloyd (Senior Fire Protection Officer, Liverpool Fire Force), whose subject will be " Domestic Fire Hazards." During the congress there will be an exhibition at the Corn Exchange and annexe which will include the Society's standard exhibition and a section devoted to home safety. At the Royal Pavilion films on road and home safety will be shown.

## Brook Motors' New Factory Site

Brook Motors, Ltd., has acquired a ten-acre site at Barugh Green, near Barnsley, for the erection of a modern winding factory for electric motors, and work will be commenced in the near future. The new plant, which will ultimately employ 500 people, will embody the latest methods of production developed at the Huddersfield works, and it will enable an output of more than two motors per minute to be maintained throughout the working day.

## Changes of Name

**Hopkinson Motors & Electric Co., Ltd.,** has changed its name to Hopkinson Electric Co., Ltd. The **Anglo-American Fan Co., Ltd.,** has become the British Silent Glow Co., Ltd., and **Paragon Electric Cleaners, Ltd.,** is now Paragon Electric, Ltd.

## Wasting Electricity Charge Dismissed

A charge against the managing director of a Manchester firm of motor-car dealers of unlawfully wasting electricity was dismissed at Wilmslow recently. It was alleged that the defendant, Charles Henry Reynolds, consumed 28,905 units in 19 weeks at his home, Hurlbote Grange, Handforth, Cheshire, the consumption in the corresponding period of the previous year being 2,444 units. For the Ministry of Fuel and Power it was stated that this " terrific and fantastic " use of electricity followed the installation of electrical appliances, including equipment for heating a glasshouse.

Defendant stated that the installation had been approved by the Cheadle and Gatley U.D.C., and the greenhouse was thermostatically controlled to cut off at 50 deg. He agreed that 16,850 units were shown as having been used on the greenhouse meter and 12,055 units on two other meters for domestic lighting, heating and cooking. Ten rooms were in use in the house, which was occupied by six people. During last winter the house was flooded and electric fires had to be switched on. Mr. T. M. Backhouse, who appeared for the defendant, claimed that the electricity used in the house was reasonable and normal for its size and that comparison with the previous year was unreasonable as the house was then empty. It was impossible for such an amount of electricity to have been used in heating the greenhouse; either the installation was defective or the meter was registering incorrectly.

## Trade Announcements

**Radio Instruments, Ltd.,** have reappointed their pre-war agents, James Logan, Ltd., of 124, West Campbell Street, Glasgow, as their Scottish agents and J. D. Morrison & Co., Ltd., of Wakefield House, 11 & 13, New Wakefield Street, Oxford Road, Manchester, as their agents for the Midlands and Northern England.

**The Dubilier Condenser Co. (1925), Ltd.,** has appointed Mr. R. N. Walker, 104, Overcliff Drive, Southbourne, Bournemouth, to be its Southern Counties agent, in the counties of Hampshire, Dorset, Sussex, Berkshire, Wiltshire and that part of Surrey south of a line from Frimley to Caterham, in succession to the late Mr. G. Lawrence.

**Clegg, Highcock & Co.** have moved to Berey's Buildings, George Street, Liverpool, 3 (telephone: Central 7000).

**Associated Fire Alarms, Ltd.,** are moving their head office to their factory at Sutherland Works, St. Andrew's Road, Walthamstow, E.17 (telephone: Larkswood 2056).

**Newalls Insulation Co., Ltd.,** has removed to Purley Way, Croydon, (telephone: Croydon 7241; telegrams: " Newsulate, Croydon ").

**E.M.P. Electric, Ltd.,** have moved to Garman Road, Tottenham, London, N.17 (telephone: Tottenham 6641; telegraphic address: "Arrester, London ").

**Hailwood & Ackroyd, Ltd.,** announce that their London and Export Sales office has now moved from Albion House, New Oxford Street, to 18, Lowndes Street, S.W.1.

## Trade Publications

**Benjamin Electric, Ltd.,** Tariff Road, Tottenham, London, N.17.—Loose-leaf priced catalogue of " Flurolier " lighting fittings, 40 and 80 W single and twin tube, including wiring diagrams and accessories.

**Metway Electrical Industries, Ltd.,** King Street, Brighton, 1.—Priced leaflet (AF. 31) illustrating universal type junction box for single and multi-core flat (lead covered or " PVC ") wiring.

**Brush Coachwork, Ltd.,** Loughborough.—Folder on uses of battery trucks in factories.

**Perihel, Ltd.,** Edge Street, London, W.8.—Priced leaflet illustrating " Handisun " ultra-violet treatment lamp, table model.

# Electrical Moisture Meter

## Applications and Methods of Use

**By L. G. Toplis***
*Associate I.E.E.*

THE use of electrical moisture meters for determining the moisture content of various substances is recognized practice in many industries, but it would seem that they have come to be regarded more as a means of obtaining a general indication of the condition of a substance than of providing a close measurement of the moisture present.

The determination of moisture content is usually regarded as a function of the works chemists, who appear to think that physicists have not attained such a high degree of accuracy as chemists habitually secure. This limitation is accepted, but it is outweighed in many cases by the advantage of rapid action obtained with the electrical instrument, as compared with the chemical method, which is tedious and frequently responsible for "bottle-necks" in production. On two occasions recently within the author's experience when the readings of such an instrument could not be reconciled with the figures obtained from chemical analysis, and the electrical instrument was therefore under suspicion, it was found on subsequent investigation that the chemical analysis was at fault and the electrical instrument gave a true indication of the moisture content of the food under examination.

In a paper read before the Institution of Electrical Engineers in April, 1945, Dr. Hartshorn and W. Wilson described the N.P.L. meter which was designed principally to give an indication of the moisture contents of cereals, seeds and food powders, the presence of moisture being represented by either capacitance or conductance in an electrical circuit. The circuit was so designed that an indication of either of these two values or any combination of the two was shown on a milliammeter.

In certain circumstances such a method has an advantage over earlier methods where the substance was regarded as a conductor of high resistance (expressed in terms of moisture content) or else took the form of a dielectric between two plates of a condenser, the moisture content being represented by the capacity of the latter. The circuit diagram of the N.P.L. instrument is shown in Fig. 1 (reproduced from the paper mentioned), and an electrical moisture meter incorporating the circuit is illustrated by Fig. 2. The phase adjustment on the left hand side of Fig. 1 ($R_3$) was in the N.P.L. instrument permanently set so that this part of the circuit was as near resonance as possible to the supply frequency. This was satisfactory when the use of the instrument was confined to the range of materials mentioned but, in order to widen the field of application to substances of varying phase values, this resistance should be under the control of the operator.

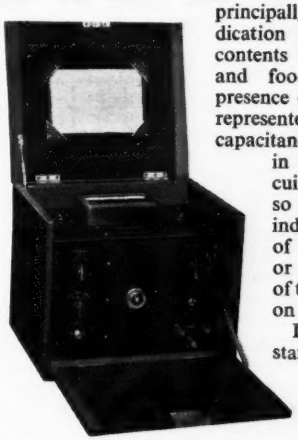

**Fig. 2. — General view of the moisture meter**

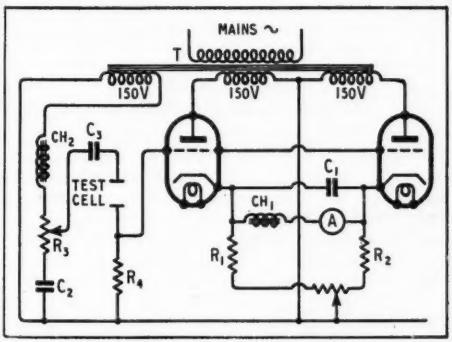


**Fig. 1.—Electrical circuit of moisture meter**
$C_1$, 2μF; $C_2$, 0·3μF; $C_3$, 0.01μF; $Ch_1$, 50 henrys; $Ch_2$, 25 henrys; $R_1$, $R_2$, 5,000 ohms; $R_3$, 5,000 ohms; $R_4$, 0·5 megohms; Valves, EBC 33

* Chairman, Toplis-Simpson & Co., Ltd.

In the instrument described below provision is made for this. Further flexibility is also obtained by providing a tapping switch on the 150-V secondary winding of this circuit, giving taps of 75 and 35 V. Above this a series regulator is connected to the primary winding of the transformer enabling constant voltage to be maintained at the valve anodes. A volt scale is included on the milliammeter or indicator, so that this instrument fulfils the dual function of voltmeter and ammeter. Slight variations of applied voltage will materially affect the moisture content readings obtained, so this should be kept constant during a test.

Experience has shown that, to give an electric moisture meter the widest application, the various parts of the circuit require to be flexible to meet the particular characteristic of the substance involved. Considerable adjustments can be made on the instrument alone (apart from the test electrode) in regard to selection of voltage. Normal and sensitive ranges on the indicator and control over the applied voltage are provided.

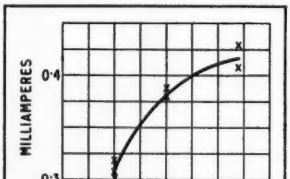


**Fig. 3. — Relationship between moisture in butter and capacitance indications.**

## Calibration

A moisture meter, which expresses its finding in terms of electrical units, is frequently handicapped by the need to convert electrical measurements into a percentage of moisture content. One way of overcoming this is by calibrating scales after conversion into moisture content values on an overall basis for the particular substance. This limits the use of the instrument to those specific materials. Even so, the accuracy of the instrument is open to question, owing to variations in the character of substances of the same classification.

In the case of the N.P.L. instrument it is suggested that users calibrate their own instruments, after having determined the electrical equivalents for the various moisture contents of the substance actually handled them. From these readings a curve can be prepared, which should give moisture content equivalents within the desired working range. This implies the possession by the user of a gravometric balance and heating oven. In the instrument here described a conversion scale can be easily dropped into place on the indicator. The scale can be calibrated from samples supplied by the user, and once completed can be used indefinitely for that substance. This enables an operator to obtain a direct reading of moisture content from the position of the needle, knowing that the calibration is based on his own particular substance, and that the scale of the instrument can be changed quite easily to suit the substance under test.

An important field for such an instrument in food production is provided by the manufacture of butter and margarine, in which statutory limitations prohibit more than a certain moisture content. Many attempts have been made to use an electrical moisture meter for this purpose, but with little success, and butter makers in this country have in some cases come to regard the problem as insoluble. The disturbing factor is the presence of free water in the butter, where it may not be fully blended. Such moisture has a high conductance value in an electrical circuit that is out of all proportion to its true moisture content. Moreover this water may contain a high percentage of salt which still further reduces its resistivity.

## Novel Test Electrode

As the outcome of experiments in this field of application a test electrode of novel construction has been designed. It takes the form of a shallow dish of dielectric material fitted into a rectangular framework, which itself carries the electrode plates; these in turn are coupled to the instrument. The butter sample is carefully packed in the dish and inserted in the frame. The feature of this device is that there is no metallic contact between the substance and the electrode plates themselves, and therefore the current reading that is obtained on the indicator is entirely due to capacitance.

From tests it would seem that the response of the instrument bears some direct relationship to water in the butter whether in a free state or otherwise. Fig. 3 shows a curve plotted on a number of repeated readings obtained by this method and, what is important, these readings can be very closely

repeated at will. Readings have in this instance been taken at only three moisture content values, on account of the difficulty of obtaining butter for experimental purposes at the present time. The values given are critical values to the butter maker when the moisture content approaches 16 per cent. The accuracy of performance so far obtained shows no greater error than plus or minus 0·15 per cent of the moisture content of the butter itself.

The adoption of this form of testing for moisture content would indicate that it may become the basis of test for a considerable number of other substances. If this is so, there are prospects that the electrical moisture meter may play a far more important part in industry than hitherto.

# ELECTRICITY SUPPLY

## Hammersmith M.D. Concession. Stretford Economy Incentive.

**Bethnal Green.**—DISTRIBUTION SCHEMES.—The Council has received loan sanction from the Electricity Commissioners in respect of a programme of capital expenditure totalling £34,703. The work to be carried out under this programme provides for the erection of five new substations, the reinforcement of the medium-voltage distribution system, and supplies of electricity to blocks of flats to be erected by the London County Council and the Bethnal Green Borough Council.

**Croydon.**—COMPLETION OF 33-KV NETWORK.—Subject to the necessary sanction the Town Council on Monday approved the completion, at an estimated cost of £253,312, of the 33-kV distribution network scheme interrupted by the war. The Council approved the scheme in 1936 and cables were laid and temporarily energized at 6·6 kV.

**Chesterfield.**—FACTORY SUPPLY.—The Electricity Committee has received sanction to borrow £1,150 for an increased supply of electricity to Lamp Caps, Ltd.

**Fulham.**—GRIT ARRESTING PLANT.—It is proposed to install multi-cyclone type grit arresting plant at the power station at an estimated cost of £300,000. The borough electrical engineer has been authorized to place orders with Prat-Daniel, Ltd., and with James Howden & Co., Ltd., respectively, for Nos. 1 and 2 boiler houses.

STORES AND WORKSHOPS.—In connection with the further extension of the power station it will be necessary to demolish certain store buildings, etc. New buildings are to be erected on a site at Argon Mews acquired for the purpose before the war, and it is proposed to take the opportunity to provide a new canteen for the distribution staff. The power station estimates include a sum of £10,000 for the replacement of demolished buildings and the Electricity and Lighting Committee recommends that the extra amount of £80,000 estimated to be needed shall be charged to distribution account reserve fund. At the moment it is only proposed to build to the extent necessary to house the existing stores, workshops and office staff.

DISTRIBUTION REORGANIZATION.—Last January the Council approved an expenditure of £170,000 for the further standardization and reinforcement of the distribution system. Cable requirements were then based on the prices ruling in 1946, but the price of copper has since risen by some 70 per cent. This, and a more precise estimation of requirements, has resulted in the cost being increased by £22,000.

NEW SUBSTATIONS.—The Electricity and Lighting Committee, as a matter of urgency, has taken steps to acquire substation sites at Munster Road (by compulsory purchase order), Fulham Palace Road and Sir Oswald Stoll Mansions, Fulham Road.

**Grimsby.**—SURCHARGE UNCHANGED.—A recommendation of the Electricity Committee that no change should be made in the 15 per cent surcharge on electricity accounts was upheld at a meeting of the Town Council. The reference back of the recommendation was moved by Councillor H. D. Mitchell, who said he was beginning to wonder whether it was an instruction from some other quarter than the Council. Alderman C. Wilkinson, replying to the discussion, said that if the money belonged to the people of Grimsby now it would belong to them when the Government took over next year. If they reduced the reserve fund and budgeted for a loss the Government would increase the tariffs when they took over. For the working-class people of the town the reduction of the surcharge would mean 2s. to 3s. 9d. each; for other people it would mean £5 to £7.

**Hammersmith.**—INDUSTRIAL FIXED CHARGES.—Some industrial consumers have raised the question of the fixed charges payable under tariff No. 5 when, in consequence of load spreading, their m.d. occurs at night. In such cases the chief electrical engineer has been authorized to make special arrangements whereby no additional payment will be required for any maximum demand recorded during the night (7 p.m. to 7 a.m.) in excess of that during the day, the consumer to bear the cost of installing the necessary apparatus for readjustment of the metering equipment, plus an appropriate rental.

ELECTRICITY SHOWROOMS.—The Electricity Commissioners have informed the Electricity Committee that they do not consider they would

be justified in approving the proposal to provide permanent showrooms, etc., in six vacant shops in Nigel Playfair Avenue at a total estimated cost of £8,050. They would, however, subject to developments under the Electricity Act, be prepared to consider the matter again in six months' time. The Committee decided to re-submit the proposal in May, 1948.

Regarding the temporary showrooms and offices in Uxbridge Road, the Committee has reported that the purchase of the freehold interest in the three premises used for the purpose has been completed at a total cost of £21,246. It recommends that application be made to the Commissioners for consent to defray this expenditure out of the surplus revenue of the undertaking.

SUPPLY EXTENSIONS.—At a cost of £27,450, the Electricity Committee is to provide a supply to 123 flats on the Kelmscott Gardens housing estate and 220 flats on the Dalling Road estate.

**Islington.**—FLUORESCENT STREET LIGHTING.—Subject to the approval of the Ministry of Transport, the Borough Council is to make arrangements for the lighting of Holloway Road, between Seven Sisters Road and Camden Road, by means of fluorescent lamps. The Electricity Committee recommends the acceptance of the tender of the British Thompson Houston Co., Ltd.—£1,489—for carrying out the work.

**Leicester.**—NEW SUBSTATION.—An electricity substation to be built on the Braunstone estate will cost £92,000.

**Manchester.**—GENERATING PLANT.—The chief engineer and manager has been authorized to open negotiations with certain firms for plant required for the third section of the Carrington generating station.

**Stockton-on-Tees.** — SUPPLY SCHEMES. — A five-year agreement has been completed for the supply of electricity to a new factory owned by George Turner & Co., Ltd., on the Dog Hill Farm industrial site. A supply of electricity is to be made available to the Boathouse Lane industrial site involving a new substation and an extension from the 11-kV system at an estimated cost of £9,271.

**Stoke Newington.**—HIRE-PURCHASE TERMS.—Under the hire-purchase scheme resumed last year the initial payment was only the amount of the first instalment. The Electricity Committee now recommends that an initial cash payment of 25 per cent of the list price shall be required, or the amount of the purchase tax if that is greater. The balance, with interest charges, is to be payable in equal instalments. Only equipment to the value of £5 or over will be covered.

VOLTAGE STANDARDIZATION.—Formal application has been made to the Electricity Commissioners for consent to raise the voltage of the a.c. supply from 230 to 240 V.

MAINTENANCE OF CONSUMERS' APPARATUS.—To improve the domestic apparatus maintenance service the Electricity Committee proposes to equip two vans with shelving to enable a comprehensive set of spare parts for cookers, wash boilers, etc., to be carried. At present, where parts are needed a second call must be made.

**Stretford.**—INCENTIVE TO ECONOMY. — To encourage domestic consumers to play their part, and so to help industry, the Stretford and District Electricity Board has decided to offer a substantial incentive. Details of the scheme which we have received from the chief engineer and manager (Mr. H. G. Bell) show that any domestic consumer who achieves an economy of at least 10 per cent during either of the winter quarters, 1947-48, as compared with the corresponding quarter in the previous year, will be given an additional discount equal to the saving achieved. For example, a consumer showing a saving of 25 per cent would be given a further discount of five shillings in the pound. Owing to staff limitations, the Board cannot arrange to check each individual consumer's account and make the necessary comparison, so this duty has been left to the consumer. The meter readers on their rounds will leave at each house a small leaflet on which will be entered the kWh used by the consumer in the relevant quarters. This leaflet will also give details of the scheme. Any consumer finding himself entitled to the discount will then make a claim on a standard form to be obtained from any of the showrooms or offices of the board.

## I.M.E.A.'s Future

### 1948 Convention to be Held

WITH the passing of the Electricity Act and the establishment of the British Electricity Authority it has become necessary for the Incorporated Municipal Electrical Association to consider its future. The Council therefore proposes to convene an extraordinary general meeting before which a memorandum will be circulated to members acquainting them of the position and of the action which it is proposed to take.

It was widely assumed that this year's Bournemouth Convention of the I.M.E.A. would be the last, but Lord Citrine, chairman of the British Electricity Authority, who attended the Convention has expressed the view that such functions serve a useful purpose and should be continued. The matter has been discussed by representatives of the Association and the Electricity Organizing Committee with the result that it has been agreed that a Convention on similar lines to those followed in the past should be held next year.

If, as is very probable, the vesting date falls before the time of the Convention the British Electricity Authority is willing to approve and facilitate the holding of the function. The I.M.E.A. Council has therefore decided to arrange a convention for next June and preliminary particulars will be circulated shortly.

# FINANCIAL SECTION

## Company News. Stock Exchange Activities.

## Reports and Dividends

**Oldham & Son, Ltd.**, report a net profit for the year ended May 31st last of £159,177, as compared with £146,172 for the preceding year. E.P.T. and profits tax require £46,000, and income tax £6,472. The final dividend is 30 per cent, making 60 per cent for the year, and £66,303 is carried forward (against £55,897 brought in). In his statement issued with the report and accounts, Mr. J. Oldham (chairman), says that plans for large-scale export development were drawn up and put into motion during the concluding phases of the war, and as a result important business connections have been established with over forty countries. New developments are a self-service cap miners' lamp and the installation for underground test of the new Oldham mine loco battery. Upon cessation of hostilities the company commenced on the production of electric vehicle batteries. Considerable business has been done in the sales of automobile and radio batteries and much valuable work carried out by the company's research and technical department.

**Aerialite, Ltd.**—The accounts of this company were abstracted in our last issue. In his statement issued with the report and accounts, Mr. L. S. Hargreaves (chairman and managing director), says that the company has increased its turnover by 43 per cent over last year. It is still producing to capacity and has reaped full benefit from the extensions to plant mentioned by him last year. A substantial export drive has been made, and he has just returned from Canada and the United States where distribution arrangements have been made in both countries. Unfortunately in the United States tariff barriers make it almost impossible to send goods from England to America, but he believes that a considerable amount of business can be done in Canada due to Empire preference, and he looks forward to a substantial turnover from the Canadian market in the future.

**East African Power & Lighting Co., Ltd.**—The annual meeting was held in Nairobi on September 24th, the chairman's speech being read by the deputy chairman (Mr. A. J. Don Small) as Major C. M. Taylor was then in the United Kingdom on leave. Regarding the suggested hydro-electric development using the Tana basin waters, the chairman stated that a satisfactory scheme for the first stages had been evolved and it was hoped to make an announcement of their proposals at an early date. Referring to the decision of the Uganda Government to expropriate the company's licences and properties in the Protectorate, he pointed out that these licences, covering a period of fifty years, were granted to them as recently as 1937 in open competition and in response to a Government advertisement. With regard to the Uganda Electricity Survey, he said that if the Government project at Owen Falls was to pay its way much larger schemes of industrial development must proceed simultaneously. The company considered that for the foreseeable future the project was far too ambitious under present conditions unless electricity in Uganda was to be subsidized for a considerable period of years.

**Telephone Rentals, Ltd.**—At the annual meeting of the company last week the chairman and joint managing director (Mr. F. T. Jackson), said that the profit-sharing scheme which they had inaugurated had been remarkably well received and was achieving its purpose in providing an additional incentive to effort. This year the sum set aside for the purpose was £21,332. With regard to the present position, the shortage of materials affecting the firms supplying their equipment had made it necessary for the time being to restrict their selling efforts to the existing subscriber market, although they realized that as an industrial concern they must be continually striving for expansion. An alteration of the name of the company to indicate the comprehensive nature of their service had been considered, but in view of the goodwill attached to the title they had decided to make no change.

**The Dubilier Condenser Co. (1925), Ltd.**, reports a profit for the year ended March 31st last of £45,840, as compared with £58,260 for the preceding year, which with other income makes £49,094. After deducting depreciation, directors' fees, etc., there is a net profit of £22,578 (against £29,822). The ordinary dividend for the year is maintained at 20 per cent and £32,687 is carried forward (against £24,076 brought in.)

**The London Electrical & General Trust, Ltd.**, reports that dividends and interest amounted to £62,943 for the year to June 30th, as compared with £58,664 for the previous year, which with other revenue makes £64,724. The final dividend is 4 per cent, again making 6 per cent for the year, general reserve receives £5,000 and £16,830 is carried forward (against £16,401 brought in).

**W. H. Dorman & Co., Ltd.**, in their accounts for the year ended March 31st, show a net profit, before taxation, of £156,023, against £97,673 for 1945-46. Taxation provision amounts to £110,000 (£77,000); £10,300 (£5,000) has been allocated to deferred repairs and £20,398 (£5,000) to reserve. The total ordinary dividend for the year is raised from 25 to 37½ per cent and £8,692 (£7,014) is carried forward.

**The Bagdad Light & Power Co., Ltd.,** reports that its net profit for 1946 amounted to £36,825 (compared with £21,733 for 1945) after taxation and the Iraq Government's participation in profits. It is proposed to pay a dividend on the ordinary shares of 6½ per cent (against 6 per cent) free of tax.

**Glenarm & District Electricity Supply Co., Ltd.**—Presenting the annual report to shareholders of the company, the Earl of Antrim (chairman) said that the Electricity Board for Northern Ireland had offered £19,000 for the plant and goodwill. A formal meeting for the winding-up of the company is being held on October 4th.

**Electrical Components, Ltd.,** proposes to pay a final ordinary dividend of 12½ per cent, making 20 per cent for the past year. The profit for the year (excluding subsidiaries) was £85,506 (against £44,283). General reserve receives £2,500 (against £7,500) and £17,412 (against £10,308) is carried forward.

**Renold & Coventry Chain Co., Ltd.**—The trading profit for 1946-47 was £280,424 (after charging depreciation, E.P.T., etc.) against £252,148 (including £65,000 recovered E.P.T.). The final ordinary dividend is 12 per cent, making 15 per cent for the year (same).

**Ferranti, Ltd.,** reports a net profit of £105,293 for the year ended June 30th last, compared with £77,007 (after crediting £225,000 E.P.T. repayment). An ordinary dividend of 6 per cent is again to be paid.

**Metal Industries, Ltd.,** report consolidated profits for the year ended March 31st amounting to £412,901 (as against £518,800 for 1945-46) before deducting depreciation £74,195 (£49,000) and taxation £170,924 (£292,100). A final dividend of 7 per cent was paid on increased capital, again making 10 per cent for the year.

**The Telegraph Condenser Co., Ltd.,** has declared an interim dividend of 5 per cent. No interim dividend was paid for the preceding year, for which a dividend of 10 per cent and a bonus of 5 per cent were paid.

**The Madras Electric Supply Corporation, Ltd.,** reports a net profit for 1946 of £74,976, as compared with £74,799 for the preceding year. The ordinary dividend for the year is 5 per cent (against 8 per cent).

**The Shropshire, Worcestershire & Staffordshire Electric Power Co.** has announced an interim dividend of 4 per cent on the "A" and 2½ per cent on the "B" shares (same).

**The Atlas Electric & General Trust, Ltd.,** reports a credit balance of £171,297 for 1946-47, as compared with £143,395 for the preceding year.

**The General Gas & Electricity Co., Ltd.,** is paying a final dividend of 15 per cent, making 25 per cent for the year (against nil).

**The Llanelly & District Electric Supply Co., Ltd.,** is paying an unchanged interim dividend of 2 per cent.

**The Metropolitan Electric Cable & Construction Co., Ltd.,** has declared an interim dividend of 15 per cent (against 5 per cent).

**Stothert & Pitt, Ltd.,** are again paying an ordinary dividend of 10 per cent, plus a bonus of 5 per cent, for the year ended June 30th last.

**The Britannia Electric Lamp Works, Ltd.,** is paying a dividend of 12½ per cent for the year, against 10 per cent (including a 3 per cent bonus).

**Electrical Finance & Securities, Ltd.,** has declared an interim dividend of 4 per cent (same).

**The Midland Counties Electric Supply Co., Ltd.,** is maintaining its interim dividend at 4 per cent.

**The South Wales Electric Power Co.** is again paying an interim dividend of 2 per cent.

**The Urban Electric Supply Co., Ltd.,** is paying an interim dividend of 4 per cent (same).

**Ericsson Telephones, Ltd.,** is maintaining its interim dividend of 5 per cent, tax free.

## Receiver Appointed

**Anderson Angell & Co., Ltd.**—C. E. M. Emmerson, 28, King Street, E.C., and R. L. Davis, 18, Theobald's Road, W.C.1, were appointed receivers and managers on September 10th, under powers contained in instrument dated April 10th, 1946.

## Liquidations

**Sterling Batteries, Ltd.** — Winding up voluntarily. Liquidator, Mr. J. M. C. Davidson, 32, Bishopsgate, London, E.C.2. Shareholders having consented in writing, it has been agreed that the period of twenty-one days' notice required for the passing of a special resolution be dispensed with.

**Wireless Electric (Wholesale), Ltd.**—Meeting October 30th at 28, Baldwin Street, Bristol, 1, to receive an account of the winding-up by the liquidators, Messrs. A. Collins and N. W. Osborne.

## Bankruptcies

**G. R. Sims,** Hartlepool Street, Thornley, Durham, electrical engineer, etc.—This debtor applied for his discharge at Durham, recently, when it was reported that money provided by friends was sufficient to enable a dividend of 10s. 4d. in the £ to be paid. The discharge was granted with effect from October 1st.

**L. Backhouse, C. H. Thornton,** and **S. Evans,** carrying on business as the Arc Electrical Co., at Palatine Buildings, Victoria Street, Manchester, electrical and wireless suppliers.—Adjudication dated July 24th, 1923, annulled. Receiving order dated July 18th, 1923, rescinded, and petition dated July 3rd, 1923, dismissed. Annulment, recission and dismissal dated September 22nd, 1947, the grounds being that it appears to the Court that all debts, statutory interest, costs and expenses have been paid in full.

# STOCKS AND SHARES

STOCK Exchange markets have settled down into a fairly equable condition, with prices firm, at lower levels, it is true, than those of a couple of months ago, but well above the lowest prices reached in the recent slump. There is plenty of money awaiting investment, as every Stock Exchange broker will testify. He is equally aware of the reluctance which money shows in returning, to any material extent, into markets which are always liable to be upset by political developments.

In the absence of Parliament, it is impossible to say whether or not there will be an autumn Budget. Some people hope there will be: others are against it. All things considered, prices remain very steady, but the volume of business has contracted sharply, and the falling-away of activity causes many a query as to how long the present state of affairs is likely to continue. The coal industry's kaleidoscopic changes almost from day to day cause markets to be alternately dull and cheerful.

### A Better Week

Electrical equipment shares have been generally steady, with a tendency to carry the recovery a stage further. Of such interest as is at present being taken in the industrial markets, they are claiming a fair share by virtue of the importance of the industry both to the home, and, according to the Cripps plan, to export markets. A recovery of 5s. to 50s. in Electric Constructions is among the week's best features. Chloride Electrical Storage have added half-a-crown, to 95s., and more modest improvements are shown by English Electric, 57s., Siemens, 31s. 6d., Brush, 6s. 9d., and B.I.C. at 38s. 9d. E.M.I. at 21s. 9d. have recovered a few pence; Cossors eased to 22s. General Cables are a better market at 38s. 9d. Others to secure rises on the week are General Electrics 87s. 6d., Johnson & Phillips 67s., Tube Investments 6⅛, and Revo 52s. 6d. H.T.A. have declined to 15s.

### Miscellaneous Price Movements

Murex have moved up by half-a-crown, to 4⅛, since publication of the profits statement. The dividend has again been brought up to 20 per cent for the year. Better prices are quoted also for Babcocks, now 71s., Hopkinsons, 4 11/16, and Metal Industries " B," 47s. 6d. De La Rue have recovered further to 49s. 6d. and British Aluminium have added 1s. at 44s. 9d. In the communications group, Cable & Wireless stocks are relatively neglected. The ordinary is up 10s. at 153. Marconi Marines, 28s., Great Northerns, 29¼, and Canadian Marconi, 10s. 9d., are lower. Home electricity supply shares are scarcely changed. Among overseas issues, Calcutta Electrics are 2s. up at 42s. Victoria Falls, at 6, and Perak Hydro, at 13s. 6d., have also gained ground. Atlas Electrics are 1s. 3d. better, at 13s. The transport group is noticeable for a jump of 75 points in B.E.T. deferred, now 1,200. The preferred put on 5, to 175.

### Preference Shares

With gilt-edged stocks in quiet demand on their present 3 per cent yield basis, the supply of first-class preference investments tends to become more restricted. The disposition is, if anything, for prices to harden. The following list covers some of the issues currently on offer in the electrical equipment market:—

| Preference | Dividend | Price | Yield % | 1947 High |
|---|---|---|---|---|
| | % | s. d. | £ s. d. | s. d. |
| B.I.C. .. .. | 6 | 31 6 | 3 16 3 | 37 6 |
| Siemens .. | 4 | 22 0 | 3 12 0 | 23 0 |
| Brush .. .. | 5¼ | 21 6 | 5 2 3 | 26 6 |
| English Electric | 3½ | 21 3 | 3 10 6 | 24 9 |
| A. C. Cossor .. | 6 | 28 6 | 4 4 3 | 33 3 |
| C. A. Parsons | 4 | 23 0 | 3 9 6 | 24 6 |
| G.E.C. .. | 4½ | 22 0 | 3 17 3 | 28 0 |
| Crabtree .. | 5 | 25 3 | 3 19 3 | 30 0 |

The last column, showing this year's highest prices, indicates that depreciation of between 15 and 20 per cent has been fairly general. By the same comparison, " Old " Consols have lost 17 per cent of their value.

### High Yielders

Four per cent. on ordinary shares is the return with which investment is apparently satisfied—at least, under present conditions—from the leaders in the industrial market. At the same time, the ebb of prices has left not a few popular investments above the 5 per cent line. Cossors, for instance, at 22s., and E. K. Coles at 17s. 6d., are almost on a 5¾ per cent basis. In another category, Hoovers at 37s. 6d. give about 5½ per cent return, having declined this year from 56s., and British Vacuum Cleaners at 15s. 6d., pay 6½ per cent on the money. Revo Electric at 52s. 6d. show a return of practically 5¼ per cent on this year's increased distribution. Aron Meter also reported higher profits this year and a bigger dividend, on which the shares, at 51s., yield £5 17s. 6d. per cent. On Electric Constructions at 50s. the yield works out at £5 per cent. Ever Ready at 34s. 9d. pay 5¾ per cent, Oldham & Son at 9s. 6d. over 6 per cent, and Walsall Conduits at 52s. 6d., £5 6s. 9d. per cent. Other relatively high yields are £5 11s. per cent on Thorn Electrics at 22s. 6d., and 6¼ per cent on Laurence Scott at 10s.

### Electrical Components

Electrical Components 5s. shares strengthened to 14s. on the declaration of a dividend of 12½ per cent, making 20 per cent for the year. The shares were the subject of a " placing " about a year ago, and the dividend declared last week is in accordance with the best expectations. The yield of £6 16s. per cent on the money indicates, however, doubt whether the Government programme for conserving fuel may not affect companies concerned in marketing electrical components and appliances.

# NEW BOOKS

## Treatise on Telegraphy. Radio Handbook.

**Telegraph Transmission Theory.** By E. H. Jolley, M.I.E.E. Pp. 124; figs. 53. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, Kingsway, London, W.C.2. Price 7s. 6d.

In a foreword Mr. F. E. Nancarrow, of the G.P.O. Engineer-in-Chief's office, says the publication of this book is undoubtedly overdue. Its necessity arises because in the old days the translating mechanism was the human brain; nowadays it is a machine which operates only over a range (the much-discussed " marge " of the C.C.I.T. conference) above and below perfect reception.

The international employment of the teleprinter, its operation over one of a number of a.c. " channels " on a single pair of wires; the use of the telephone network for both telegraphy and telephony, all are responsible for an entirely new outlook on the subject.

Much information is scattered about in a number of French, German and American technical journals, but the theory of the subject badly needed treatment in book form by someone with the necessary experience and reputation, such as that enjoyed by the author. His treatise is intended to be an advance part of a new and completely revised edition of the late T. E. Herbert's well-known manual which, the publishers announce, is in preparation.

The first section of the book defines various terms as agreed upon by the C.C.I.T. and explains the baud, telegraph distortion and margin. The effect of build-up time in relation to length of signal pulse is very clearly shown graphically. This section will be understood by the most junior student.

The second section is devoted to d.c. line transmission theory. The rise and fall of current in a condenser-resistance circuit, an inductance-resistance circuit and a resistance-condenser network approximating to a telegraph line are treated at length. The effect of the shunted condenser and the electromagnetic shunt are explained and the Kelvin arrival curve for a line without leakance and inductance and with zero terminal impedances is described. The build-up of signals by the superposition of the arrival curves due to the individual letter signal pulses is detailed. Finally an elementary method of obtaining the growth of current with time when a battery is suddenly applied to a circuit is explained. There would appear to be an error on p. 25 where the effect of leakage on a line is said to reduce the value of the transmitted current. The opposite is, of course, the case.

Section 3 deals with a.c. transmission theory. The Fourier series is quoted and the classical a.c. theory is stated in full and illustrated with curves. The decibel is defined and examples of its application are given. Section 4 is concerned with the relationship between the steady state and transient conditions. In this section it is shown how, by calculating the amplitude and phase of the a.c. components into which a square-topped wave can be resolved and summing these, the arrival curve can be obtained, the method taking into account any terminal impedances which may exist. A cable having relay and signal shaping terminations is compared with the same cable having zero terminal impedances, taking four terms of the Fourier series. Section 5 deals with filters, while Section 6 treats of the transmission of a.c. signals. The effect of build-up time, side band production and band width required, frequency spacing, line requirements, variations in power level and multi-tone working are discussed. Section 7 is concerned with transmission requirements for telegraph switching systems.

An appendix contains the proofs of the various formulæ used in the main text. Altogether this book is a most excellent one, both for the matter included and the methods of presentation. The diagrams and general appearance are first rate and the book can be heartily recommended to the student.—H.H.H.

**The Practical Radio Reference Book.** Edited by Roy C. Norris. Pp. 288; figs. 246; index. Odhams Press, Ltd., Long Acre, London, W.C.2. Price 8s. 6d.

This is a reference book which will be of use chiefly to the serviceman. Starting with some brief notes on fundamentals and units, these are followed by tables of symbols and abbreviations. There are notes on d.c. calculations and on series and parallel connections; a.c. circuits are dealt with, as well as resonance and selectivity. There are charts for the design of iron-core components.

Valuable features of the book are the tables of valve characteristics and I.F. transformer frequencies. To many, these alone will be worth the price of the book.—W.T.C.

## Books Received

**Handbook of Industrial Electroplating.** By E. A. Ollard and E. B. Smith. Pp. 287; figs. 97; index. *Metal Industry*, The Louis Cassier Co., Ltd., Dorset House, Stamford Street, S.E.1. Price 15s.

**Frequency Modulation Engineering.** By C. E. Tibbs. Pp. 310; figs. 172; index. Chapman & Hall, Ltd., 37, Essex Street, London. W.C.2. Price 28s.

**Statistical Methods in Research and Modulation.** By Owen L. Davies. Pp. 292; index. Oliver & Boyd, Ltd., Tweeddale Court, Edinburgh. Price 28s.

# NEW PATENTS

## Electrical Specifications Recently Published

*The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.*

### 1939

THE Metropolitan-Vickers Electrical Co., Ltd., C. Dannatt and F. H. Belsey.—"Electric follow-up control systems." 22235. July 31st, 1939. (Cognate applications 4638/40 and 13814/40.) (592208.)

English Electric Co., Ltd., J. E. Calverley and S. Potter.—"Electrically propelled vehicles." 31494. December 5th, 1939. (Cognate applications 32234/39, 552/40, 2232/40 and 3265/40.) (592299.)

### 1940

Metropolitan-Vickers Electrical Co., Ltd., A. Tustin and W. Partington.—"Dynamo-electric machines." 1408. January 23rd, 1940. (592209.)

### 1943

Brush Development Co.—"Piezo-electric units." 2835. July 7th, 1941. (592163.) "Piezo-electric transducer means." 18357. February 18th, 1942. (592217.)

Standard Telephones & Cables, Ltd.—"Electro-deposition of selenium." 9890. November 29th, 1941. (592165.) "Stable pulse generator." 15327. December 20th, 1941. (592258.) "Radio apparatus." 15467. July 4th, 1942. (592168.) "Impedance matching transformers." 17691. July 4th, 1942. (592216.) "Thermionic amplifiers and modulators." 18162. May 18th, 1942. (592259.)

Sperry Gyroscope Co., Inc.—"Apparatus for measuring high-frequency power." 12048. February 4th, 1942. (592119.)

Western Electric Co., Inc.—"Radiators and receivers of compressional wave energy." 14456. February 19th, 1942. (592255.) "Coupling means for electrical cavity resonators." 14842. April 17th, 1942. (592256.) "Vacuum tube oscillators." 14917. November 6th, 1941. (592257.) "Alternating-current rectifiers." 18907. March 1st, 1941. (592260.) "Devices for the transmission or reception of ultra-high-frequency electro-magnetic waves." 21942. November 28th, 1941. (592120.)

### 1944

Western Electric Co., Inc.—"Coupling arrangements for coupling conductive channels such as coaxial lines to wave guides in ultra-high-frequency electric wave transmission systems." 295. March 17th, 1942. (Cognate application 296/44.) (592302.) "Electron discharge devices." 482. May 31st, 1941. 592261.) "Electron discharge devices." 483. May 31st, 1941. (592262.) "Electron discharge device and method of manufacturing the grid electrode thereof." 710. February 12th, 1942. (592263.) "Light-sensitive device." 907. May 27th, 1941. (592303.) "Cathode-ray devices." 18955. October 12th, 1943. (592229.)

General Electric Co., Ltd., and L. G. Ward.—"Testing of armatures of dynamo-electric machines for electrical faults." 2548. February 11th, 1944. (592221.)

Standard Telephones & Cables, Ltd.—"Selenium rectifiers and method of production." 9083. August 21st, 1943. (592173.)

National Cash Register Co.—"Electric impulse responsive apparatus." 9739. June 4th, 1941. (592174.)

Brush Development Co.—"Piezo-electric crystal elements and units and piezo-electric transducers and devices." 11837. July 30th, 1942. (592222.)

Marconi's Wireless Telegraph Co., Ltd.—"Magnetron oscillator circuit." 14403. April 24th, 1941. (592305.) "Oscillation generator." 14404. April 24th, 1941. (592121.) "Short-wave antennæ." 17735. June 27th, 1942. (592180.)

Westinghouse Electric International Co.—"Electron-discharge devices." 14779. September 24th, 1943. (592266.)

G. E. F. Fertel, R. W. L. Batt, J. A. Barrable and C. S. Wright.—"Wave guides for wireless systems." 14869. August 3rd, 1944. (592224.)

F. E. Oldham.—"Electric heating systems." 15437. August 14th, 1944. (Cognate application 18422/44.) (592179.)

Metropolitan-Vickers Electrical Co., Ltd., and R. W. Bailey.—"Method and means of treating metal forgings and castings of annular form." 21489. November 2nd, 1944. (592182.)

Simplex Electric Co., Ltd., C. Lacy-Hulbert and A. V. Barton.—"Electric heating elements." 21680. November 6th, 1944. (592124.)

G. Wilkinson.—"Electrodes in cooking and boiling vessels and the like for the heating of liquids by the passage of electric currents therethrough." 23188. December 5th, 1946. (592186.)

H. C. Cooper.—"Lighting fittings for adjustable drawing-boards." 24431. December 6th, 1944. (592237.)

Philips Lamps, Ltd., A. Kershaw and C. E. Slade.—"Electric welding arrangements." 24440. December 6th, 1944. (592238.)

H. Jackson.—"Constant voltage rectifiers." 25420. December 18th, 1944. (592189.)

### 1945

W. W. Triggs (P. R. Mallory & Co., Inc.).—"Electro-forming of rectifiers." 173. January 2nd, 1945. (592191.)

Hazeltine Corporation. — "Gain-control arrangement for radio receivers." 428. February 11th, 1944. (592269.) "Gain-control arrangements for wave-signal receivers." 7777. April 19th, 1944. (592274.)

Sulzer Frères Soc. Anon.—"Control of an internal-combustion engine electric power plant as used for the propulsion of a vehicle." 483. January 8th, 1944. (592193.) Ditto. 3460/1. March 9th, 1944. (Additions to 592193.) (592201/2.) "Super-regenerative receiver." 1350. February 11th, 1944. (592271.)

H. Hughes & Son, Ltd., D. O. Sproule and A. J. Hughes.—"Means for the detection and measurement of magnetic fields." 659. January 8th, 1945. (592241.)

General Electric Co., Ltd.—"System of tap-changing under load for electric transformers." 2435. February 3rd, 1944. (592198.)

W. Beardmore & Co., Ltd., and W. E. Dickie. —"Means for securing metallic wall elements of building structures to foundations." 2778. February 3rd, 1945. (592199.)

British Thomson-Houston Co., Ltd., and H. de B. Knight.—"Manufacture of electric condensers." 4447. February 22nd, 1945. (592316.)

Siemens Electric Lamps & Supplies, Ltd., and J. N. Aldington.—"Electric discharge lamps." 5917. March 9th, 1945. (592246.)

Siemens Electric Lamps & Supplies, Ltd., and G. O. Stephens.—"Electric discharge lamps." 6775. March 17th, 1945. (Cognate application 10709/45.) (592248.)

Plessey Co., Ltd.—"Vibratory electromagnetic interrupters." 8406. May 2nd, 1944. (592276.)

Welding Supplies, Ltd.—"Electric arc welding and cutting." 8761. February 29th, 1944. (592280.)

Metropolitan-Vickers Electrical Co., Ltd., and H. K. Ramsden.—"Trolley-bus electric motor control systems." 10866. April 30th, 1945. (592289.)

R. G. Garfitt.—"High-frequency electrical transmission lines." 10931. April 30th, 1945. (592126.)

M. C. Goodall, R. W. Sutton and C. S. Wright.—"High-frequency tunable electrical circuits." 12499. May 17th, 1945. (592131.)

T. J. McDermott.—"Thermionic valve circuits." 12503. May 17th, 1945. (592328.)

Standard Telephones & Cables, Ltd., and R. H. Robins.—"Mounting of piezo-electric crystals." 12602. May 18th, 1945. (592132.)

E. Mestitz.—"Electric timing relays or switches." 12616. May 18th, 1945. (592133.)

M. Ward.—"Electric generators for cycle lighting." 12639. May 18th, 1945. (592331.)

Automatic Telephone & Electric Co., Ltd., and C. E. Beale.—"Telephone systems." 12678. May 19th, 1945. (592333.)

J. A. Crabtree & Co., Ltd., W. E. Hill and T. D. G. Wintle.—"Electric terminals." 12713. May 22nd, 1945. (592135.) "Electric connector blocks." 12714. May 22nd, 1945. (Cognate application 14931/45.) (592136.)

F. C. Heayberd & Co., Ltd., F. C. Heayberd and J. Krimholtz.—"Control apparatus for electric luminous discharge tubes." 12735. May 22nd, 1945. (592140.)

British Insulated Cables, Ltd., and J. Chesworth.—"Form of electric connector device." 12808. May 22nd, 1945. (592150.)

Allmanna Svenska Elektriska Aktiebolaget and L. Dreyfus.—"Electric induction furnaces with iron cores." 12844. May 23rd, 1945. (592152.)

British Thomson-Houston Co., Ltd., and R. S. Wells.—"Luminescent compounds." 12897. May 23rd, 1945. (592157.)

Sperry Gyroscope Co., Inc.—"Apparatus for dividing high-frequency power." 24309. February 4th, 1942. (Divided out of 592119.) (592161.)

Western Electric Co., Inc.—"Devices for the transmission of ultra-high-frequency electromagnetic waves." 34748. November 28th, 1941. (Divided out of 592120.) (592162.)

## Trade Marks

APPLICATION has been made for the registration of the following trade marks. Objections may be entered within one month of the dates mentioned:—

**September 17th**

MIDGETRON. No. 648370. Class 9. Thermionic discharge tubes.—Park Royal Scientific Instruments, Ltd., 52, Minerva Road, London, N.W.10.

**September 24th**

HAMRAD (design). No. 644,776, Class 9. Electrical apparatus and appliances included in Class 9, and scientific apparatus and appliances. —Hamrad Wholesale, Ltd., 348, Portobello Road, Ladbroke Grove, London, W.10.

MAGILEC. No. 650,047, Class 9. Electrical apparatus for domestic purposes and included in Class 9.—Stormlight Electrical Co., Ltd., 160-162, Mile End Road, London, E.1.

## Export Inquiries

WE have received the undermentioned inquiries from firms and individuals overseas who wish to secure agencies for British electrical equipment and appliances or to import them into their territories. We shall be glad to pass on to them replies received from readers, which should be addressed to the Editors, quoting the number given in parentheses. We cannot vouch for the standing of inquirers and manufacturers replying to them will no doubt require the usual references:—

**East Africa.**—A firm with head office at Dar-es-Salaam, Tanganyika, wishes to secure sole distributors' agencies for refrigerators, electrical plant, installation material and household appliances for Tanganyika, Zanzibar and Uganda. (X.191.)

# CONTRACT INFORMATION

## Accepted Tenders and Prospective Electrical Work

## Contracts Open

*Where " Contracts Open " are advertised in our " Official Notices " section the date of the issue is given in parentheses.*

**Bedfordshire.** — October 18th. Education Committee. Electric lighting installation, etc., at Luton Technical College. (September 26th.)

**Belfast.**—October 14th. Town Council. Electrical installation, Falls Road transport depot. City surveyor, City Hall.

**Birmingham.**—October 20th. Electric Supply Committee. Electric lighting equipment for railway sidings and roadways at Hams Hall " B " station. (September 26th.)

October 20th. Domestic electrical apparatus. (September 26th.)

**Cambridge.**—Electrical installation in the Trumpington new junior and infants' school. Applications for plans and specifications by October 11th. (See this issue.)

**East Retford.**—October 11th. Town Council. Two electrically operated vertical-spindle pumps for the Goosmore Lane pumping station. Borough surveyor, Municipal Offices.

**North Scotland.**—Hydro-Electric Board. Ten miles of 132-kV steel tower transmission lines. Tender documents available on and after October 6th. (See this issue.)

**Plympton St. Mary.**—October 17th. R.D.C. Domestic apparatus. (September 19th.)

**Rochdale.**—November 3rd. Electricity Department. 33-kV underground cables. (See this issue.)

**Southport.**—October 11th (extended date). Corporation. Oil-cooled static transformers. (September 12th.)

**Stoke-on-Trent.**—November 12th. Electricity Department. Two 1,000-MVA outdoor oil circuit breakers, switchgear structures and two indoor control panels, as an extension of existing 33-kV equipment. (See this issue.)

## Orders Placed

**Croydon.**—Corporation. Accepted. Vacuum cleaning plant for the boiler house of the Warlingham Park Hospital (£424).—British Vacuum Cleaner & Engineering Co.

**Manchester.**—Electricity Committee. Recommended. 33-kV switchgear, High Street substation.—Ferguson, Pailin. Automatic voltage control equipment.—Ferranti. Switchgear, Bradford Colliery substation.—Metropolitan-Vickers Electrical Co. Batteries and charging equipment.—Alton Battery Co. Switchgear remote-control equipment.—Standard Telephones & Cables. H.p. steam valves, Stuart Street station.—Hopkinsons. Cables for boilers, Stuart Street station.—Pyrotenax.

Public Health Committee. Accepted. Cable for X-ray department, Withington Hospital.—Aberdare Cables.

**Warrington.**—Corporation. Accepted. Cables for twelve months from October 9th.—British Insulated Callender's Cables.

## Contracts in Prospect

*Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.*

**Alfreton.**—Factory, Nix's Hill; W. V. Betts & Son, architects, 2, St. Peter's Church Walk, Nottingham.

**Beckenham.**—Rebuilding garage and depot, Beck Lane, Elmers End; London Passenger Transport Board, 55, Broadway, S.W.1.

**Bedlington.**—Central and branch libraries for the U.D.C.; W. Hall, surveyor.

Houses (48) by direct labour; surveyor, U.D.C. Offices.

**Bermondsey.**—Rebuilding factory premises; Peak, Frean & Co., Ltd., Keeton's Road.

**Blackley.**—Factory additions, Ward Street; Wallpaper Manufacturers, Ltd.

**Bootle.**—Extensions to and reinstatement of Cunard Works, Bankhall Lane; A. E. Shennan, architect, 17, North John Street, Liverpool.

**Braintree.**—Model bakery for Braintree Co-operative Society, Ltd.; C.W.S. Architects' Department, 99, Leman Street, London, E.1.

**Broughton.**—New schools, St. Thomas of Canterbury R.C. Church (£150,000); Rev. Fr. M. Daly, P.P., The Presbytery, 327, Great Cheetham Street East.

**Bury St. Edmunds.**—Fire station, Fornham Road, for Corporation; borough engineer, Town Hall.

**Caerphilly.**—Aluminium houses (200); U.D.C. surveyor.

**Carlisle.**—Houses (48) at Upperby; city engineer, 18, Fisher Street.

**Cheetham.**—Canteen and garage for Lancashire Hygienic Dairies, Ltd.; Matley, Brotherton & Mills, architects, 39, Oxford Street, Manchester, 1.

**Chesterfield.**—Houses (56), Shirland and Beighton sites, for R.D.C.; John Hall & Co., builders, 59, Churchdale Road, Frecheville, Sheffield.

**Derby.**—Houses (56), Woods Lane, Chaddesden (£67,712); borough engineer.

**Doncaster.** — Houses (74), Edlington, for R.D.C. ; W. Firth, Ltd., building contractors.

**Dudley.**—New maternity block, Tipton Road, for Guest Hospital Board of Management; A. T. Butler, architect, 31, Priory Street.

**Eccles.**—Extensions, Bentcliffe Chemical Works, Salter Lane, for Lankro Chemicals; Ivor E. Meredith, architect, 7, Green Bank Avenue, Hall Green, Birmingham, 28.

**Foleshill.**—Rebuilding St. Paul's Church; Sir Charles Nicholson, architect, 2, New Square, Lincoln's Inn, W.C.1.

**Hatfield.**—Technical college, for Herts. C.C.; Easton & Robertson, architects, 54, Bedford Square, London, W.C.1.

**Hebburn-on-Tyne.**—Factory on the site of the former Newcastle Shipyard, for Reays Gear-works, Ltd., Oakwellgate, Gateshead.

**Holmes Charel.**—Extensions, food factory, London Road, for Benger's Food, Ltd.; A. Purves, architect, 12, St. Ann's Square, Manchester, 2.

**Hyde.**—County primary school, Hickenfield estate, for Cheshire E.C.; E. M. Parkes, county architect, The Castle, Chester.

**Keighley.**—Extensions to works, for C. A. Rix, Ltd., Dalton Lane; J. B. Bailey & Son, North Street.

**Keswick.**—Additions to Southey Mill, for the Cumberland Pencil Co., Ltd. (£35,000); Hustle-Rite Construction Co., Ltd., Lancaster.

**Kincardine.**—Houses for agricultural workers (50), various parishes; county architect, Viewmount, Stonehaven.

**Lewisham.**—Houses (119), on five sites; borough surveyor, Lewisham Town Hall.

**Manchester.**—Works, Broughton Street and Broughton Road, Cheetham, for W. & T. Avery, Ltd ; H. Greenhalgh, architect, 15, Mawdsley Street, Bolton.

Reinstatement of buildings and additions, Walker's Croft and Fennel Street, for Board of Governors of Cheetham Hospital and Library; T. Scott (Manchester), Ltd., builders, 12, Atherton Street.

Factory, Rusholme Road, for Jenner Foods, Ltd., and Ferns Surgical Supplies, Ltd.; Burns & Anderson, builders, 134, Oxford Street, Moss Side.

**Newcastle - on - Tyne.** — Factory, Blenheim Street, for E. Baker & Co.; Hetherington & Wilson, architects, County Chambers, Westgate Road.

Extensions to the gear shop and oil seal department, at the works of George Angus & Co., Ltd.; S. Milburn & Partners, Y.M.C.A. Buildings, Fawcett Street, Sunderland.

Erection of development and research building, City Road, for Thomas Hedley & Co., Ltd., soap makers; Holland & Hannen & Cubitts, Ltd., builders, 1, Queen Anne's Gate, London, S.W.1.

**Newport (Mon.).**—Factory, for E. J. King & Sons (Newport), Ltd., Marlborough Road; Sir Percy Thomas & Son, 10, Cathedral Road, Cardiff.

**Oldham.** — Rebuilding factory, Rowland Street, for Smiths (Purito Products), Ltd.; J. S. A. Young, architect, 12, St. Ann's Square, Manchester, 2.

Rebuilding Atlas Meter Works, for George Orme & Co.; J. S. A. Young, architect, 12, St. Ann's Square, Manchester, 2.

**Reddish.**—Houses (172), Houldsworth estate; W. Farley & Co., Ltd., builders, 129, Longford Road, W., Reddish.

**Rochdale.**—Central omnibus station, for T.C.; S. H. Morgan, borough surveyor.

**Salford.**—New Broughton High School for Girls, Kersal Farm site,; W. A. Walker, city engineer, Town Hall.

**Seaton.**—Electrical installations in 80 new houses for U.D.C.; S. E. Burgess, surveyor, U.D.C. Offices.

**South Shields.**—New factory, for Coulthard & Co., Ltd., Laygate Lane; R. Collins, architect Russell Chambers, King Street.

**Swansea.**—Steel houses (750), Gendros, Penlan, Waunarlwdd and West Cross (£816,288), for T.C.; borough engineer.

Extensions to Swansea General and Eye Hospital; E. R. Brown & Partners, 11, Calvert Terrace.

**Walsall.**—Premises, Ablewell Street and Tantarra Street; Walsall & District Co-operative Society, Ltd., Bridge Street.

Factory, Bolt Lane; Sanders & Proffitt, architects, 145, Lichfield Street.

**Watford.**—Factory extensions, Chester Road, for Standard Range & Foundry Co., Ltd.; C. Brightman & Son, Ltd., Ebury Road.

**Westminster.**—Reinstatement after fire of Westminster Technical Institute; H. T. Oliver & Sons, Ltd., 371, Clapham Road, S.W.9.

**Wigan.**—Extensions, Pagefield Ironworks, for Walker Bros. (Wigan), Ltd.; A. Wigan & Son, Ltd., builders, Manchester Road.

**Wythenshawe.**—Factory, Bradnor Road, for Walter Bennett (Spare Parts), Ltd.; G. Bullimore, architect, 50, Barnfield Road, Davenport, Cheshire.

## Woman's Fair and Exhibition

A UNIT kitchen, for which it is possible to buy all the appliances separately as they can be afforded, is an interesting feature of the Woman's Fair and Exhibition being held at Dorland Hall, Regent Street, London, until November 22nd. The electrical items installed in this kitchen include a refrigerator, water heater, washing machine, kettle and toaster. There is also on view a separate display of some other electrical labour-saving devices.